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Towards Wound Closure Optimization: Final Report

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LaserSurge, Inc.

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Abstract (Limit: 200 words)

Extensive experimentation with many combinations of lasers and chromophores was conducted to determine the optimal parameters for laser tissue welding. New Zealand White rabbit small bowel was used as an in vitro model for this study. The analysis indicates that particular chromophores can be utilized to enhance the effectiveness of certain lasers. For example, India ink is an effective chromophore for the 1.06 micron Nd:YAG laser, while blood is most effective for the 0.514 micron Ar^{++} laser. The 2.1 micron Ho:YAG laser produced strong chromophore-free welds, and also produced strong welds in the presence of India ink and blood. The laser welding literature indicates that Indocyanine Green is an adjuvant to laser welding with the 0.808 micron Ga:Al:As diode laser. The diode lasers that were examined in this study did not provide sufficient energy to weld tissue and evaluate these statements. Indocyanine Green did prove to be an effective chromophore for the 0.532 micron KTP laser. The apparatus designed and developed for this study provides an unique method to determine the laser tissue welding parameters which will produce the strongest welds.

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Summary

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Introduction

LaserSurge, Inc, of Rochester, NY was established to develop, demonstrate, and facilitate the clinical use of automated surgical laser delivery systems. The speed, effectiveness, and reliability of using laser energy to connect or weld living tissue makes laser tissue welding one of the most promising areas of medical research today. The controlled application of laser energy thermally induces intrinsic tissue changes which lead to both immediately strong bonds between tissue and rapid restoration of tissue function. Conventional surgical techniques typically require sutures and staples to close tissue wounds or to construct anastomoses (i.e., surgical connections that provide functional communication between hollow organs such as bowel). A surgeon's bonding of tissue using laser tissue welding can be compared to a metal worker's handling of steel. Whereas the conventional suturing or stapling is like the use of screws or rivets in steel, laser tissue welding, like welding steel, uses an outside energy source to cause intrinsic material changes which alone provide for the strong bond. A fundamental requirement to weld either material is that the surfaces to be welded be in intimate contact with each other. To fully realize the enormous potential of this revolutionary wound closure modality, an enhanced theoretical understanding of laser tissue welding is essential. In an effort to better recognize and evaluate the many factors that determine a successful laser tissue weld, LaserSurge has developed a laser tissue welding equation which describes laser tissue welding as a function of its component parameters; lasing parameters, chromophores, and tissue parameters. Using this structured approach, an investigator can readily dissect and compare the effects of changes in individual or multiple variables. This study was designed to identify the most favorable laser tissue welding conditions. To accomplish this goal, an integrated laser tissue welding and tensiometry (weld strength measurement) system was designed, constructed, and tested. This system permits the user to selectively vary several parameters of interest including welding temperature, welding time, aperture size, laser type, power, and chromophores. Experimental trials using different combinations of the aforementioned parameters were performed in this study.

Methods, Assumptions, and Procedures

Methods

Device Refinement and Evaluation

In order to examine the effects of multiple combinations of lasers and chromophores, a new device was developed to quantify the strength of laser welds. The laser welding/tensiometry apparatus permits any laser which can be transmitted through an optical fiber to be coupled to the beam alignment system. The beam alignment system configured the beam so that it slightly overfilled the aperture. The beam passed through a high-speed shutter which opened and closed in response to the thermocouple temperature reading. The aperture size was fixed at either 0.5 x 4.0 mm or 2.0 x 4.0 mm, and the aperture was placed just above the surface of the tissue strips to be welded. The beam impinged perpendicularly upon the tissue strips at the site of apposition. A thermocouple was placed between the strips so that it was positioned 1 mm beneath the surface of the weld. The strips were then brought into contact by a piezoelectric motor under computer control. The laser welding temperature control program allowed the operator to designate the parameters of interest, including the welding control temperature. Following welding, the welded tissue was pulled apart and the load required to rupture the weld was measured as a function of the distance moved. Graphs of load versus distance were generated to determine maximum weld strength.

The tensiometry software was seamlessly integrated into the laser welding control program by Mr. William Kraft. This new program eliminated the need to reboot the computer between experimental trials. This major improvement permitted more rapid data acquisition and reduced the average time between trials to approximately five minutes.

The thermocouple placement system has also been modified to provide more reproducible and accurate temperature measurements. A single thermocouple was mounted on a specially-designed plexiglas holder. This thermocouple was placed 1 mm below the surface of the apposed tissue at the site of welding, as depicted in Figure 1 in Appendix C. The temperature recorded from the thermocouple controlled the opening and closing of the shutter mechanism, thereby maintaining the designated tissue welding temperature. The new thermocouple holder permits easier, faster, and more reliable thermocouple placement.

A new problem surfaced during the experimentation. The stages began to stall and resist free movement because of dried bowel and saline which had entered the stage. The stages were removed, cleaned, and remounted. Periodic cleaning and maintenance have rectified this problem.

Assumptions

An implicit assumption in the original design of this experimental protocol is that the freshly harvested in vitro bowel very closely resembles native in vivo bowel. The time from resection to welding was minimized by sequentially harvesting small sections of bowel from intravenously anesthetized rabbits. The resected bowel was placed in physiological saline to maintain its integrity, while the remaining intact bowel was returned to the

abdomen for later use. Tissue processing and handling were minimized to the extent possible. Tissue trauma was minimized by handling and manipulating the bowel gently. We have assumed that the in vitro tissue would not be significantly altered by the removal and processing steps. The veracity of this assumption is important since the intent of this study is to generate data which will be readily transferrable to clinical applications.

One set of experiments suggests that the in vitro bowel model may not be wholly representative of the in vivo state. When more than one hour elapsed between bowel resection and welding, the welds produced were clearly inferior to welds produced using freshly harvested bowel under the same conditions. This lack of success may be attributable to changes in tissue turgidity and perhaps also to other biological effects (platelet aggregation and adhesion, etc.). The bowel turgidity appears to change as a result of storage in physiological saline. It is unclear whether this change might influence the laser welding of bowel. Ischemia and oxygen deprivation may also cause changes which are responsible for the difference seen between welding in vitro and in vivo.

As a consequence of the in vitro alterations to bowel, the weld strengths obtained in this study were much lower than anticipated based upon our earlier in vivo data. In order to obtain recognizable welds, the highest laser power and temperature settings were employed. Several of the lasers, namely the diode and $Argon^{++}$, were unable to provide the high power output required to weld tissue. Thus, the results for the diode and Argon lasers are inconclusive, and few or no welds were performed using these lasers.

Experimental Procedure

The experimental protocol required the resection of small bowel from New Zealand White rabbits. As discussed in the third quarter 1990 report, weld strength appears to diminish as the length of time between bowel harvesting and welding increases. In order to more closely emulate the clinical setting, fresh bowel was sequentially resected from an intravenously anesthetized rabbit (see Figure 2 in Appendix C for a complete description of the experimental protocol). The harvested tissue was cut into strips measuring 4 mm x 20 mm. The strips were carefully positioned on the laser welding/tensiometry apparatus. The thermocouple was positioned 1 mm deep at the site to be welded and the tissue strips were brought into apposition. Next, the laser was fired and, following the laser exposure, a welded tissue seam was created where the tissue strips were in contact. Thus, the thermocouple was imbedded in the welded tissue. The laser welding temperature control software directed the opening and closing of the shutter to maintain the designated welding temperature. Immediately following laser welding, the tissue was pulled apart and the load required to break the bond (in grams) was measured as a function of the distance (in millimeters) moved. Load versus distance plots were generated to assess the strength of each weld. Maximum strength was determined for each weld.

The 0.808 micron diode lasers used in this study were not powerful enough to use for laser welding using the apparatus as designed. Both LaserSurge's Spectra Diode Laboratory 3 W laser diode array and Columbia-Presbyterian's 1.5 W IRIS Medical OcuLight SL diode were coupled to the laser welding/tensiometry apparatus. The power delivered to the weld site, as measured by a power meter, was insufficient to weld tissue, since less than 0.15 W was transmitted through the optical delivery system. No appreciable temperature rise was observed, even with the Indocyanine Green chromophore. Thus, further studies of the diode laser and its interaction with chromophores were not performed.

Another laser which was initially included in this study was the 1.32 micron Nd:YAG. Rochester General Hospital has one 1.32 micron laser, and it had not been used in more than one year. When the laser was turned on, the laser's power setting mechanism did not function. This laser was unable to be repaired prior to the conclusion of this study. Thus, the 1.32 micron Nd:YAG laser was not studied further.

The Rochester General Hospital 0.514 micron Ar^{++} laser was studied. This laser, a 7.5 W Lexel Aurora Model 150 Pump Laser and a Model 600 Dye Laser, is a tremendously large research unit. The delivered power was quite low, approximately 0.7 W, and this precluded testing of some chromophore and temperature combinations.

The 100 W, CW, Sharplan 2100 1.06 micron Nd:YAG laser was examined using all chromophores and both aperture sizes. The maximum power of 5.0 W (delivered to the site of welding) was selected for use throughout since, at the lower temperatures even with this high power, weld strength was low. Thus, the lower power settings were not examined.

The Columbia-Presbyterian Medical Center in New York, NY has a Coherent Two Point One Holmium laser, with a maximum output power of 15 W operating in pulsed mode. The 2.1 micron Ho:YAG was examined at approximately 1 and 5 W with the small and large apertures.

The 20 W, CW, LaserScope 0.532 KTP laser was also examined in this study. Both aperture sizes were examined at the highest obtainable delivered power of 4 W.

The power delivered to the weld site through the optical system was occasionally not sufficient to attain some of the higher temperatures. These results are indicated in the data section that follows.

Results and Discussion

Results

The data collected and included in the subsequent analysis are limited in number. Most of the early data collected using the ASYSTANT data acquisition program has been excluded due to problems with the tensiometry apparatus, as will be explained in the Discussion (see Appendix B for these force versus distance plots). A great deal of time was devoted to software development and testing, and therefore, the results reported herein generally come from one or two samples. A thorough statistical analysis was not performed; rather, averages were obtained for each laser and chromophore combination. These averages were assessed to determine the most promising combinations. The averages are presented in Table 1.

TABLE 1- MAXIMUM WELD STRENGTH (g)

0.514 Micron Argon (Small Aperture, 0.7-0.8W delivered)

TEMP	BLOOD	ICG	INDIA INK
UNWELDED	0.9	0.6	0.2
50° C	1.2	0.7	1.1
60° C	1.4	1.0	0.9
70° C	-	0.7	1.3
80° C	3.8	-	-
100°C	-	-	-

0.532 Micron KTP (Small Aperture, 4.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK
UNWELDED	0.7	0.1	0.5
50° C	1.7	1.0	0.4
60° C	1.1	2.2	0.5
70° C	1.7	2.7	0.9
80° C	1.3	1.3	1.0
100° C	2.1	3.4	0.6

0.532 Micron KTP (Large Aperture, 4.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK
UNWELDED	-	0.1	-
50° C	-	0.7	-
60° C	-	0.8	-
70° C	-	1.0	-
80° C	-	1.0	-
100° C	-	3.7	-

1.06 Micron Nd:YAG (Small Aperture, 5.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK
UNWELDED	0.2	0.1	0.5
50° C	0.9	0.9	1.0
60° C	1.5	1.1	0.7
70° C	1.6	1.2	2.8
80° C	1.9	1.0	2.0
100° C	1.8	1.1	18.6

1.06 Micron Nd:YAG (Large Aperture, 5.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK
UNWELDED	-	-	1.0
50° C	-	-	1.0
60° C	-	-	1.0
70° C	-	-	1.0
80° C	-	-	1.25
100° C	-	-	2.0

2.1 Micron Ho:YAG (Small Aperture, 5.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK	NO CHROMO
UNWELDED	0.6	1.7	0.6	0.7
50°	1.8	3.4	5.6	4.0
60°	3.7	2.9	9.4	5.8
70°	4.8	9.6	7.0	7.9
80°	13.6	5.9	21.0	8.9
100°	29.4	10.9	21.0	20.8

2.1 Micron Ho:YAG (Large Aperture, 5.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK	NO CHROMO
UNWELDED	0.6	0.9	1.0	0.8
50° C	0.6	4.0	5.4	13.9
60° C	1.5	11.4	2.4	1.1
70° C	2.8	2.8	16.3	2.8
80° C	31.3	45.0	14.2	34.0
100° C	36.5	50.8	2.1	39.0

2.1 Micron Ho:YAG (Small Aperture, 1.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK	NO CHROMO
UNWELDED	1.3	0.8	1.6	1.2
50° C	2.1	2.1	1.7	1.7
60° C	2.8	0.4	2.4	1.4
70° C	2.4	4.8	3.4	1.5
80° C	1.5	3.6	7.0	2.1
100° C	9.5	5.9	17.9	2.9

2.1 Micron Ho:YAG (Large Aperture, 1.0 W delivered)

TEMP	BLOOD	ICG	INDIA INK	NO CHROMO
UNWELDED	1.0	0.3	0.2	0.2
50° C	6.7	2.7	1.3	1.5
60° C	6.1	6.8	0.9	-
70° C	5.5	24.5	2.0	4.4
80° C	4.9	4.1	0.8	1.4
100° C	11.3	5.3	3.1	4.1

NOTES:
BLOOD=fresh whole blood collected in a Vacutainer blood collection tube with heparin.
ICG=prepared as a 2X solution (25 mg Indocyanine Green per 10 ml aqueous solvent).
- =unable to perform.

Discussion

Thermocouple Placement

The earlier observation that thermocouple placement is crucial continued to be supported by experimentation. If the thermocouple is placed above the weld site, the recorded temperature is an artefact which corresponds to the heating of the thermocouple and not to the heating of the tissue at the weld site. If the thermocouple is placed too deeply, it again fails to accurately represent the temperature increase at the site of welding since the recorded temperatures are lower than those at the weld. Since the laser welding temperature control program controls the temperature at the weld site based upon the thermocouple measurements, proper thermocouple placement is imperative. The final thermocouple holder design provides adequate reproducibility. When thermocouple placement was incorrect, as evidenced by either an abnormally short or a protracted time to attain the stipulated control temperature, the trial was repeated with fresh tissue strips.

Prior to the design and construction of the new thermocouple holder, there were major problems with thermocouple placement. The thermocouple was difficult to position reproducibly, and thus, much of the early data is erroneous. Since the temperature control program utilizes feedback from the thermocouple, and since the thermocouple was incorrectly positioned, the time of laser exposure as well as the actual temperature at the weld site were incorrect as well.

Chromophore Delivery and Placement

Precise chromophore placement was another important factor in this study. Each of the chromophores tested was a liquid. Attempts were made to deposit the chromophore at the weld site using a micropipettor. This allowed a fixed amount of chromophore to be deposited, but the application was not evenly distributed along the weld seam. A cotton-tipped applicator was used to apply a barely visible coat of chromophore to both tissue strips prior to bringing the strips into apposition. The strips were then brought into contact by the computer-controlled piezoelectric motor. When the requisite apposition was obtained, the top surface of the weld site was gently wiped with a clean cotton-tipped applicator to remove any chromophore which oozed upwards when the tissue was compressed. When too much chromophore was placed at the top of the weld site, excessive energy was absorbed at the surface, rather than in the deeper areas of the weld site, and smoking, charring, and diminished weld strength were noted. Chromophore placement in the deeper half of the weld site resulted in stronger, more homogeneous welds.

Maintenance of equipment, software package, and its effect on data.

Maintenance of the laser welding/tensiometry apparatus was crucial. The stages upon which the tissue is clamped are highly susceptible to stalling if they become contaminated with dried bowel and saline. Stalling of the motor due to a contaminated stage was readily apparent on the first control run of the day, as the tensiometry plots of force versus distance indicated the resistance of the stage to movement. Periodic removal of the stages for cleaning and maintenance was a necessity. The outside surfaces of the laser welding/tensiometry apparatus were carefully cleaned after each use. These steps prevented corrosion of the apparatus.

Initially, however, the problem of stalling was not so readily apparent. Using the original ASYSTANT data acquisition software package, we were unable to obtain plots of the data in either real time or immediately after the completion of the trial. To plot data in ASYSTANT required a lengthy process of file conversion and computer rebooting. Thus, data was not analyzed until after the animal had been sacrificed. This software problem resulted in the generation of tremendous amounts of erroneous data (see Appendix B), since it was impossible to interpret the effect of stage resistance on the measured weld strengths.

Since there were substantial problems with the software, several different software programs were utilized during this study. ASYSTANT was utilized for the earliest data acquisition, but it was cumbersome and inefficient. The time between welding and tensiometry was often more than five minutes. The final version of the temperature control and tensiometry program is written in BASIC and can switch from the welding temperature control program to tensiometry in a matter of seconds. The data acquired using the BASIC programs was imported into either Lotus 1-2-3 version 2.1 or Lotus Symphony release 2.0 for subsequent analysis and graphing.

All data were collected at the laboratory and were stored on 3.5 inch high density floppy disks to permit data analysis at the office. Additional backup copies of the data have been made for the LaserSurge software archives in case of loss or damage to the working disks. These disks are stored off site.

Overall results- difference in aperture size and its effect, power delivered and its effect, chromophores and their effect, time of welding and its effect

Aperture size was one parameter examined in this study. Two aperture sizes were utilized, 0.5 x 4.0 mm and 2.0 x 4.0 mm. The small aperture, with its attendant higher power density, generally produced stronger welds. This was true for all lasers examined, except for the Ho:YAG. For the 5.0 W Ho:YAG trials, the large aperture produced better welds with either Indocyanine Green or in the absence of chromophore. For the 1.5 W trials, the large aperture again produced stronger welds with Indocyanine Green, blood and without a chromophore.

Power densities can also be calculated for the two aperture sizes used. The power densities, in W/cm^2, were:

- Small Aperture, 1 W- 50
- Small Aperture, 5 W- 250
- Large Aperture, 1 W- 12.5
- Large Aperture, 5 W- 62.5.

Since the large aperture appeared to weld better than the small aperture for the Ho:YAG laser, perhaps the increased surface area of welding was responsible for the strong welds seen.

High and low power settings were also examined. The higher power of 5 W produced welds of superior strength when compared to the lower power welds. This is true for equal welding temperatures, and seems surprising since the lower power setting often required a longer total laser exposure to reach the desired welding temperature.

The effect of the length of exposure to laser energy on weld strength was not assessed in this study. Most of the temperature settings used required between 15 and 30 seconds to reach the designated control temperature. When the control temperature was attained, feedback from the thermocouple to the shutter control maintained the desired temperature for 10 s. Since there was significant variation in the amount of time required to reach the predetermined welding temperature, the differences due to the variation of controlled exposure would be very difficult to interpret. Thus, a single, fixed 10 s exposure was consistently used throughout the study.

The relationship between maximum temperature and weld strength is also unclear. The highest temperature examined, 100 degrees C, usually elicited smoking as well as tissue blanching and desiccation. Occasional charring was noted in some samples. As mentioned above, the time required to reach the desired temperature varied from sample to sample. Thus, the conclusion that weld strength appears to increase with increasing temperature must be tempered with caution. This is particularly true because the 100 degree welds were often slightly weaker than the 80 degree welds. We speculate that this might be due to increased thermal injury at the higher temperature. Many samples that were welded at 100 degrees became charred or carbonized, and the tissue was dry and brittle. This type of extreme thermal injury may compromise the strength of the weld, and may explain why the 100 degree welds were weaker than the 80 degree welds. Many of the 100 degree welds that were mildly desiccated and blanched seemed to be strongly welded. The overall pattern seemed to indicate that weld strength did increase with increasing temperature.

Conclusions

Laser tissue welding is successful when the correct combinations of laser wavelength, chromophore, and aperture size are utilized. Based upon the in vitro results obtained in this study, the following laser/chromophore combinations appear to show promise for laser tissue welding:

- 0.514 micron Ar^{++}- blood or ICG chromophore
- 0.532 micron KTP- blood or ICG chromophore
- 1.06 micron Nd:YAG- India ink chromophore
- 2.1 micron Ho:YAG- blood, India ink, or no chromophore.

In comparing the weld strength produced by each of these lasers, the Ho:YAG laser clearly produced the strongest welds. Many of the Ho:YAG welds appeared to be full thickness welds. The optimal welding temperature for any of the tested laser and chromophore combinations appeared to be between 80 and 100 degrees C. The higher power levels seemed to produce stronger welds, at least in the range of 1 to 5 W. A certain minimum power is required to increase the tissue temperature to the desired range (80 to 100 degrees C). Whether additional power above this threshold actually improves the strength of the welds cannot be asserted from the data collected.

Recommendations

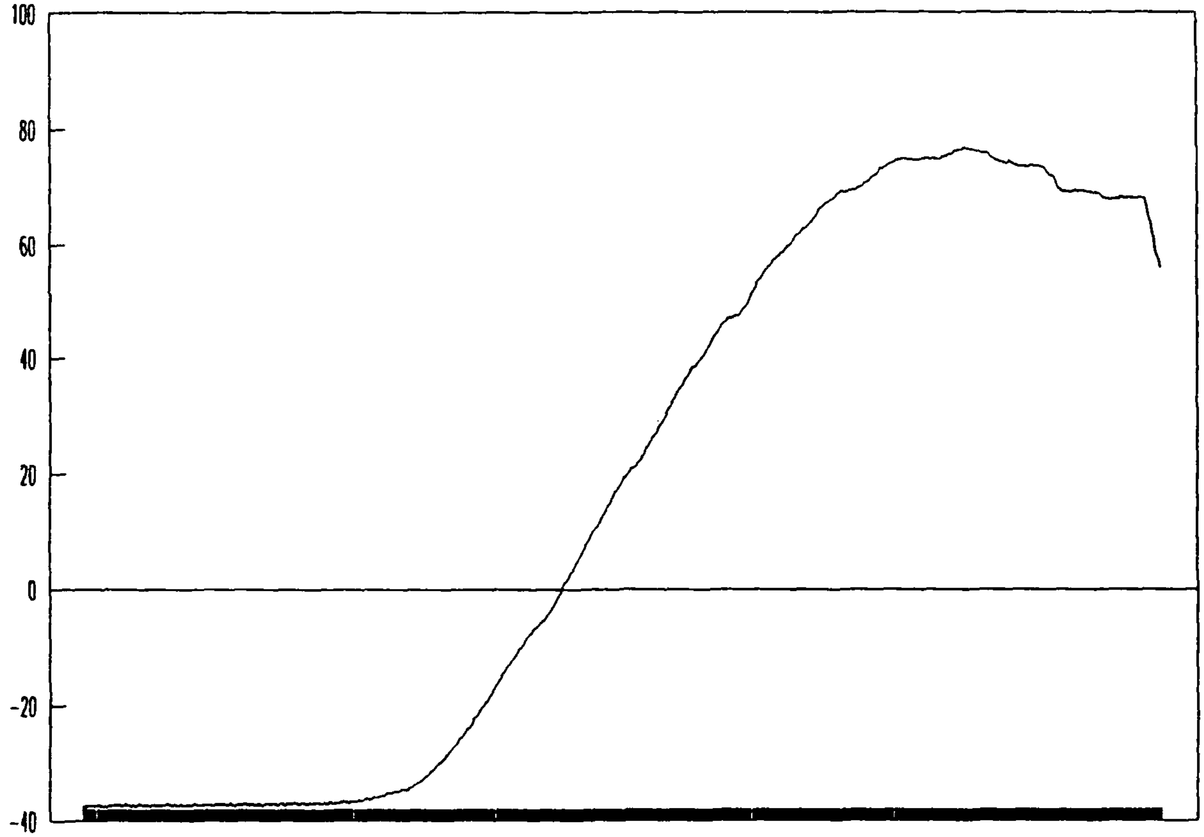
The laser welding/tensiometry apparatus developed for this study provides an unique and ideal method to analyze the effects of various parameters on weld strength. The in vitro model has some limitations, and an in vivo corroboration of these results is needed. An in vivo model would permit an assessment of the effects of thermal injury and healing, two clinically relevant issues.

Laser tissue welding continues to show great promise for clinical application, and the data generated in this study provide a solid foundation for future pre-clinical and clinical investigations of this new modality.

Appendix A- Included Data

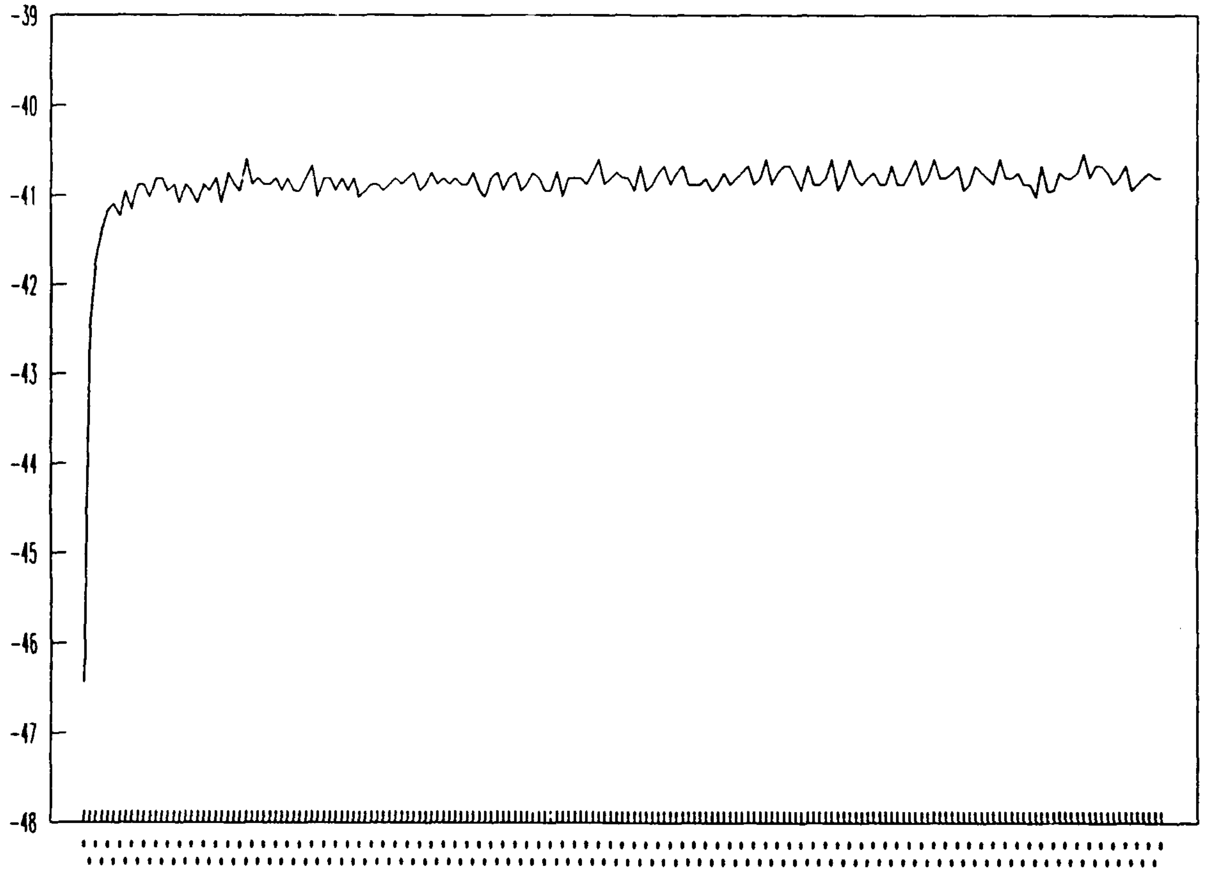
~~1.06µ Nd: YAG~~ KTP
small aperture

ONE STRIP UNWELDED CONTROL SEP27A



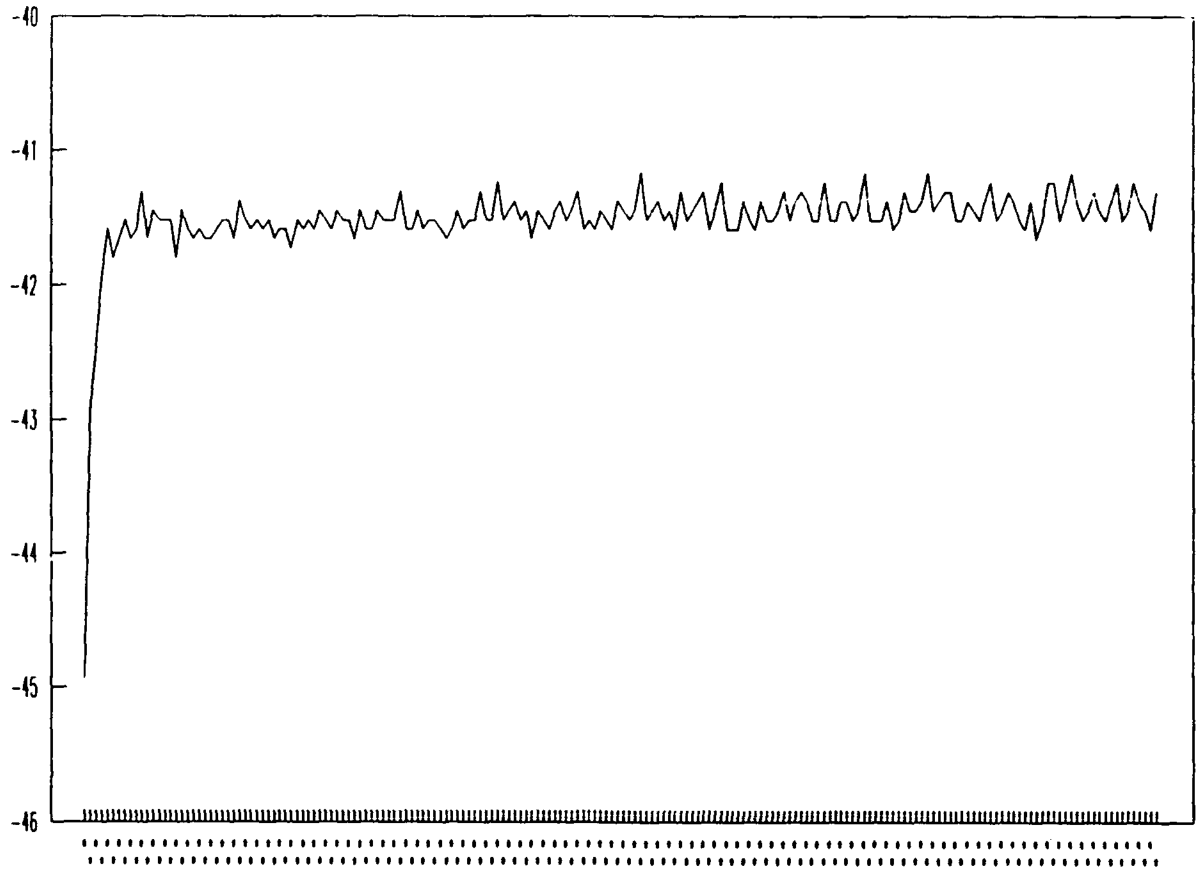
~~1.06 μm Nd: 1/46"~~ TWO STRIP UNWELDED CONTROL SEP27B

Small aperture



~~Nd:YAG~~ KLF TWO STRIP INDIA INK UNWELDED SEP 27C

small aperture CONTROL

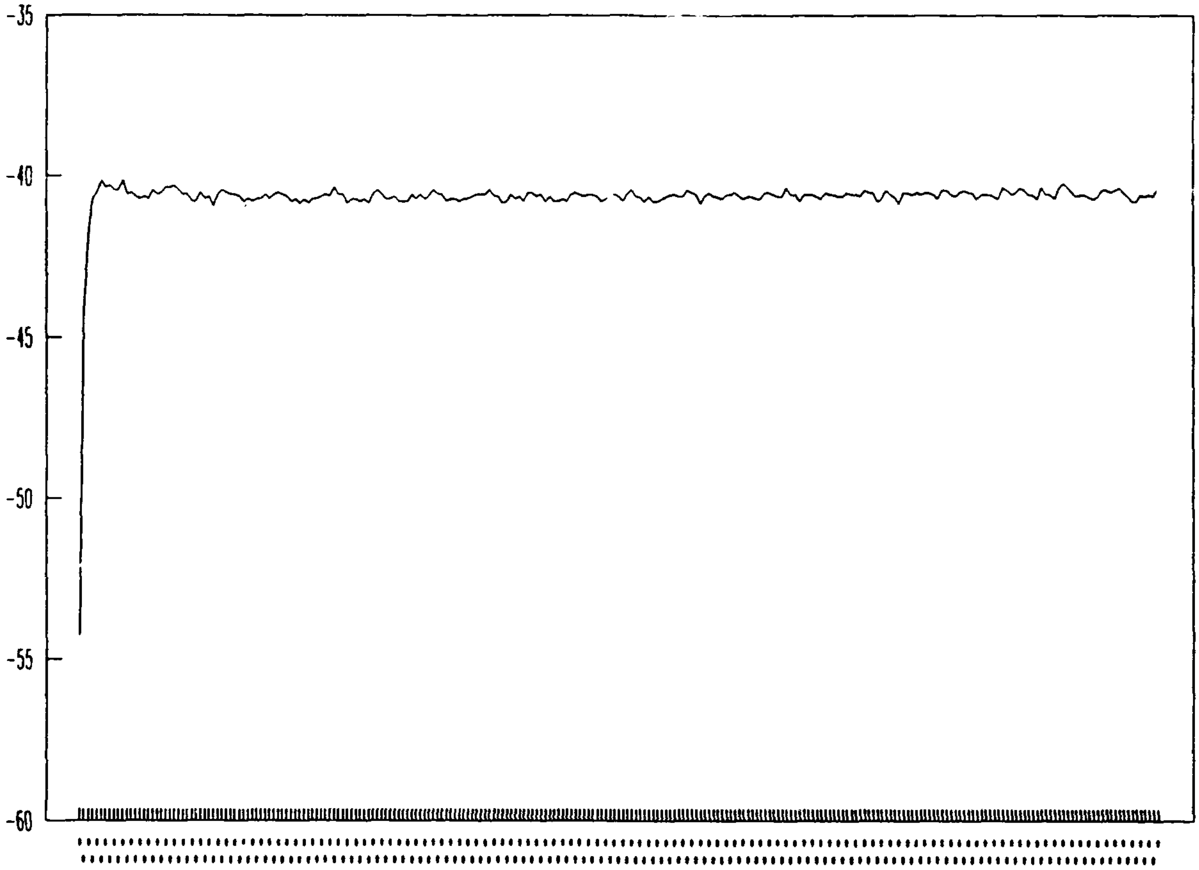


~~1.06 µm Nd:YAG~~ KTP

small aperture

INDIA INK - CONTROLLED AT 50°C

SEP27D

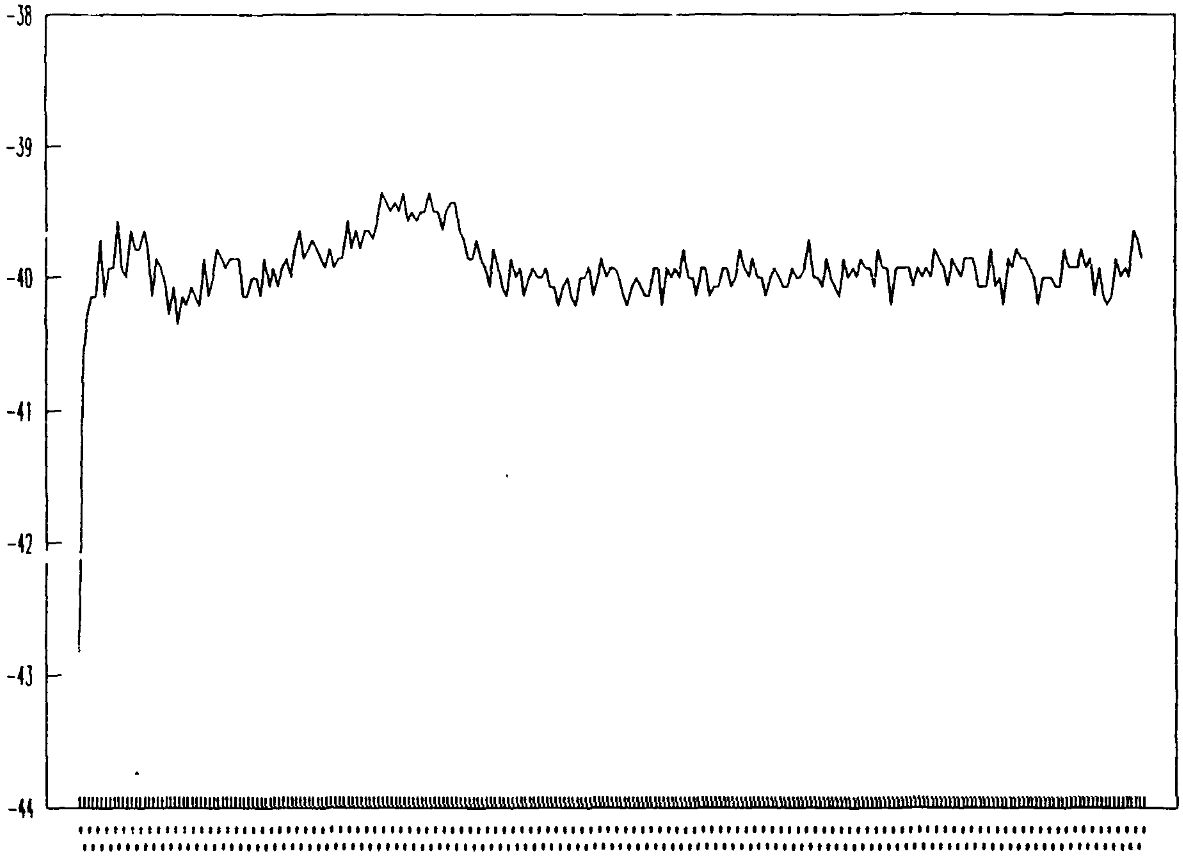


~~1.06µm Nd:YAG~~ KTP

small aperture

SEP 27F

INDIA INK - CONTROLLED AT 70°C

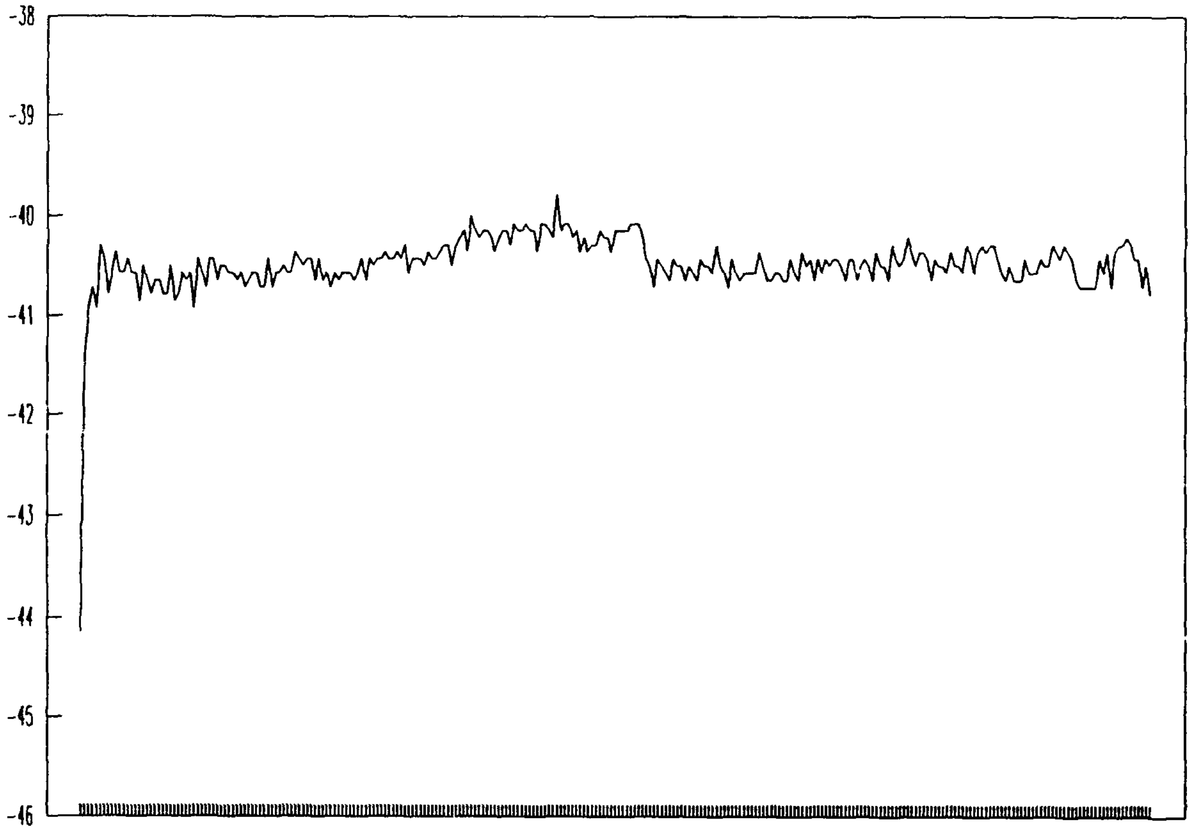


~~1.06 μm Nd:YAG~~ K_1

Small aperture

SEP 27 G

INDIA INK CONTROLLED AT 80°C

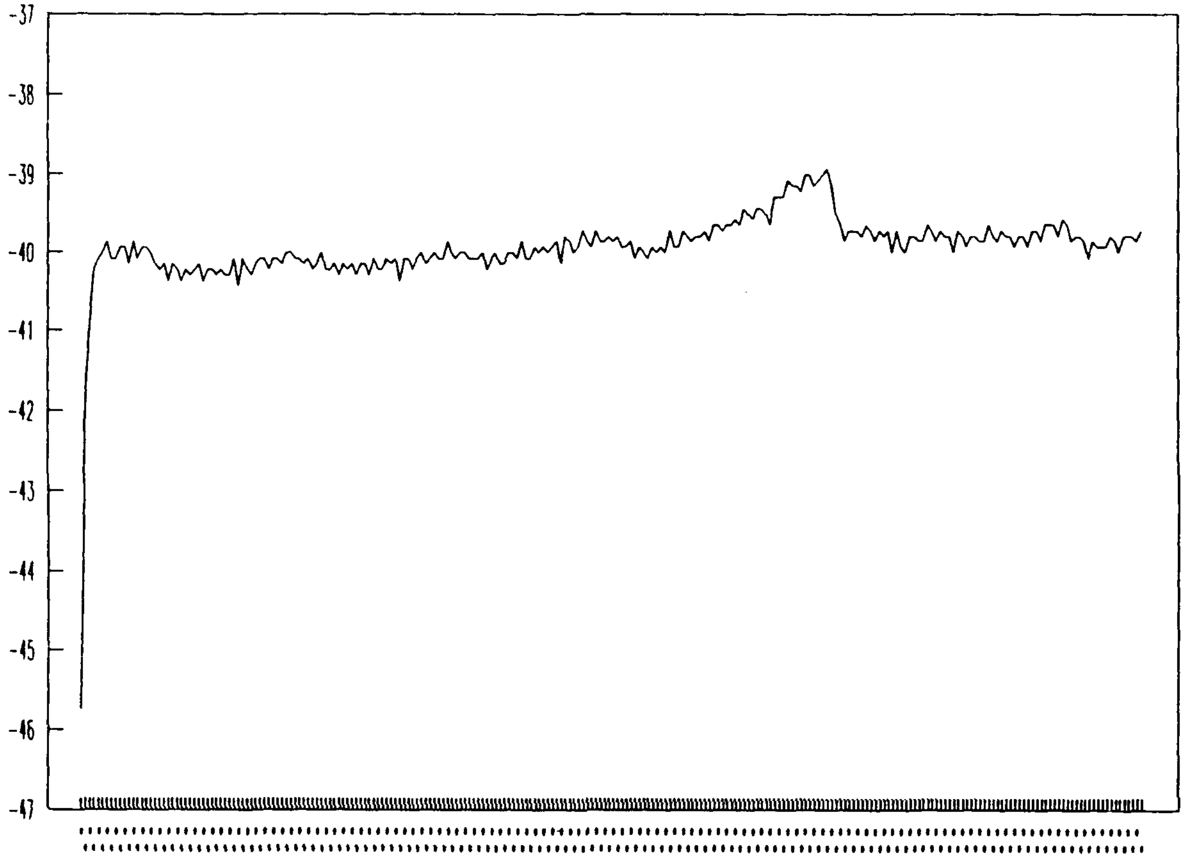


~~1.06μm Nd:YAG~~ KTP

SEP 27 H

Small aperture

INDIA INK CONTROLLED AT 100°C

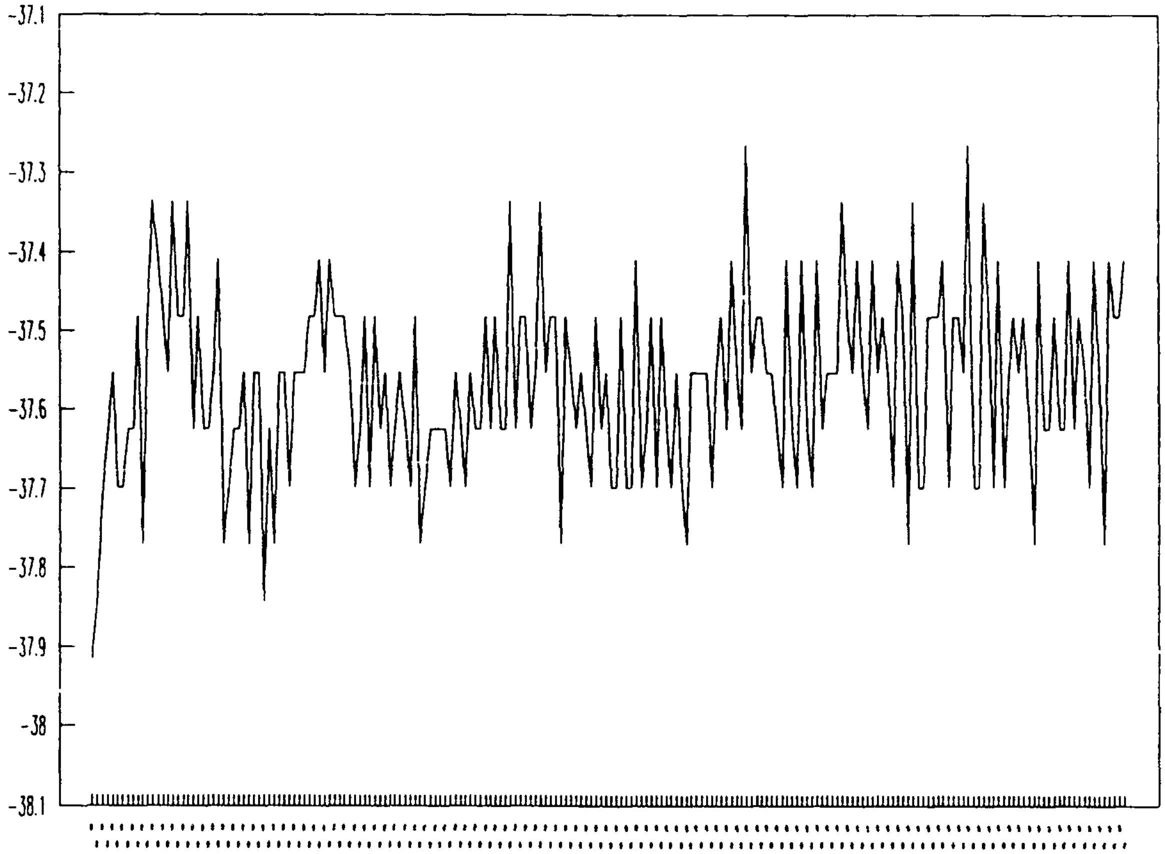


~~1.06μm Nd:YAG~~ KTP

small aperture

SEP 27 0

BLOOD UNWELDED CONTROL



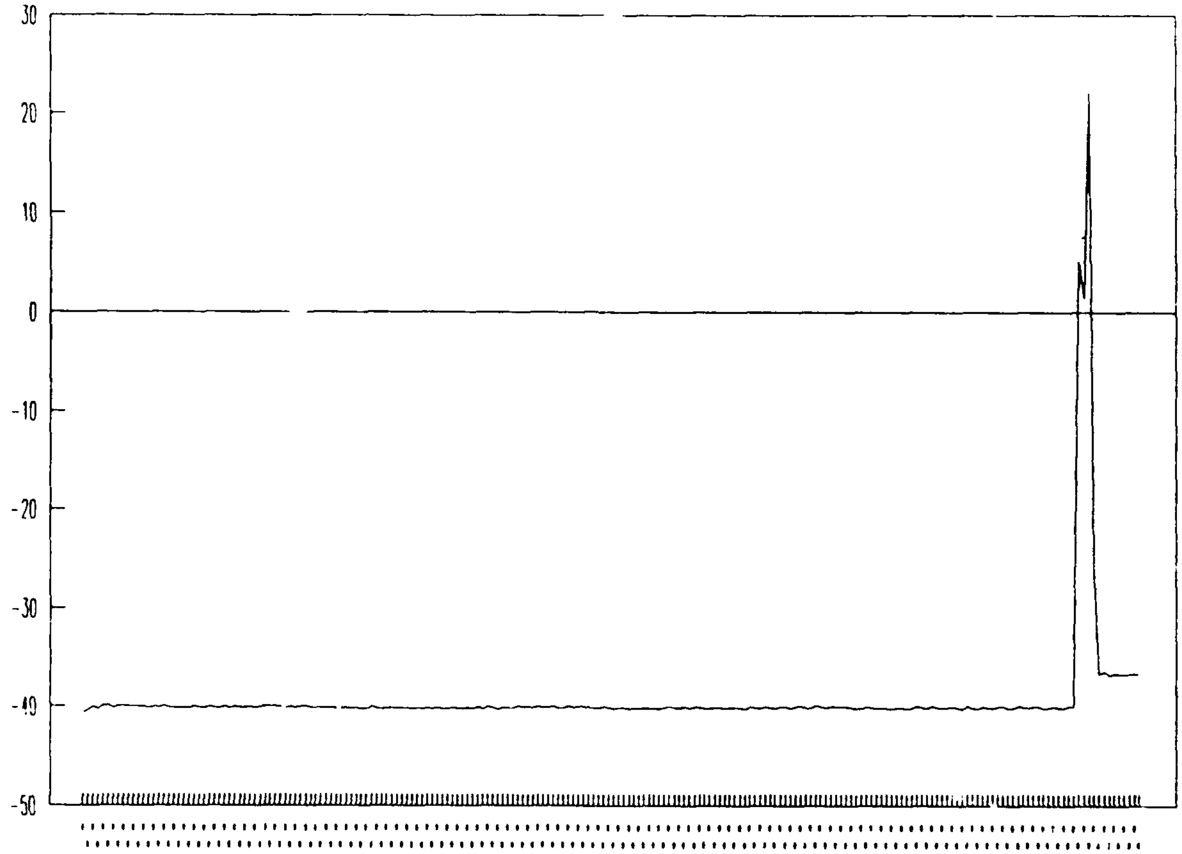
~~1.06 μm Nd·YAG~~ KTP

small aperture

SEP 27?

BLOOD CONTROLLED AT 50°

(touched table at end of run)

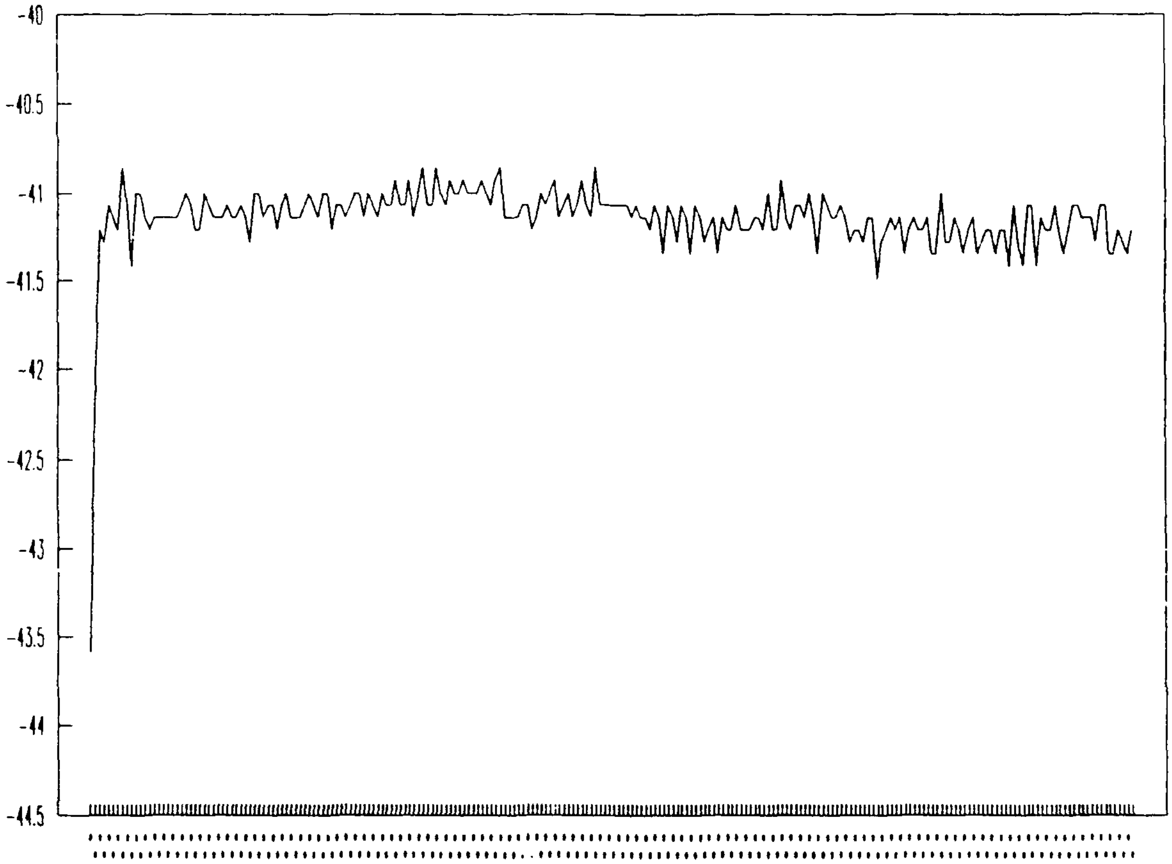


~~1.06μm Nd:YAG~~ KTP

SEP 27Q

Small aperture

BLOOD CONTROLLED AT 60°C

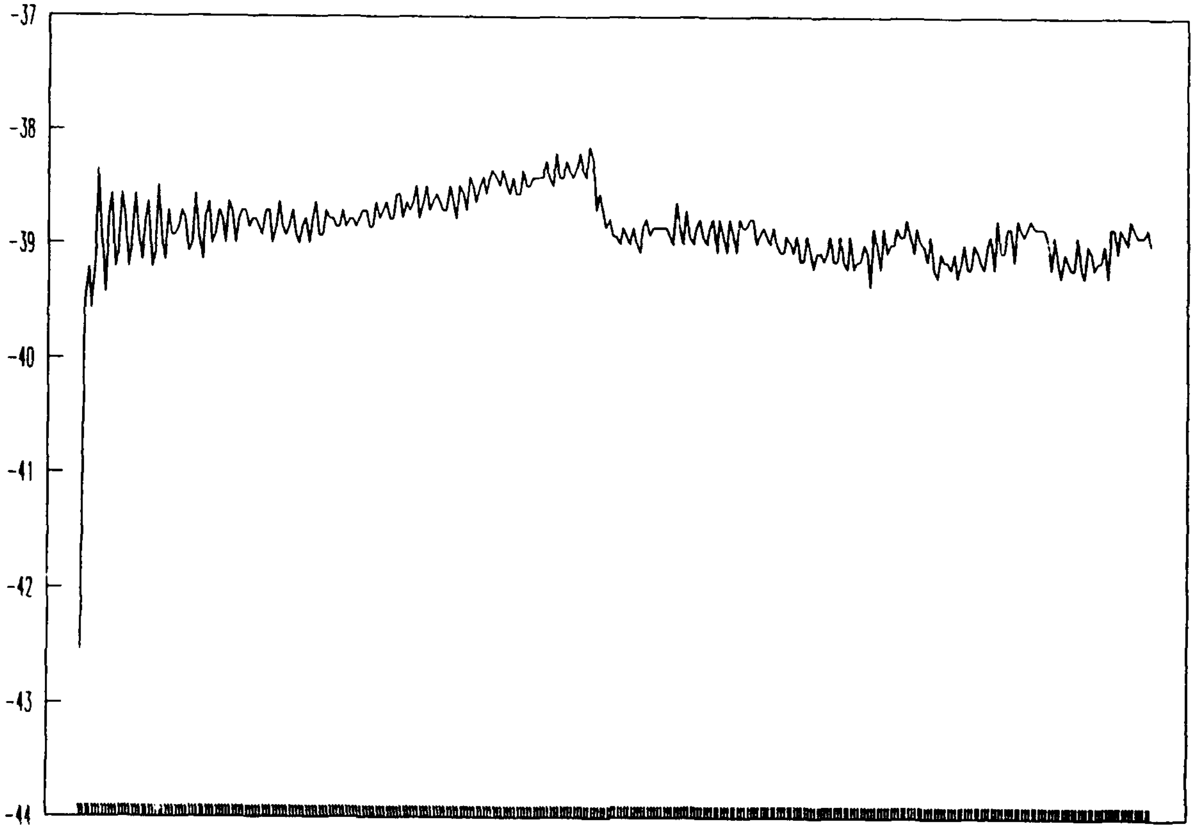


~~1.06 μm Nd:YAG~~ KTP

Small aperture

SEP 27[redacted]R

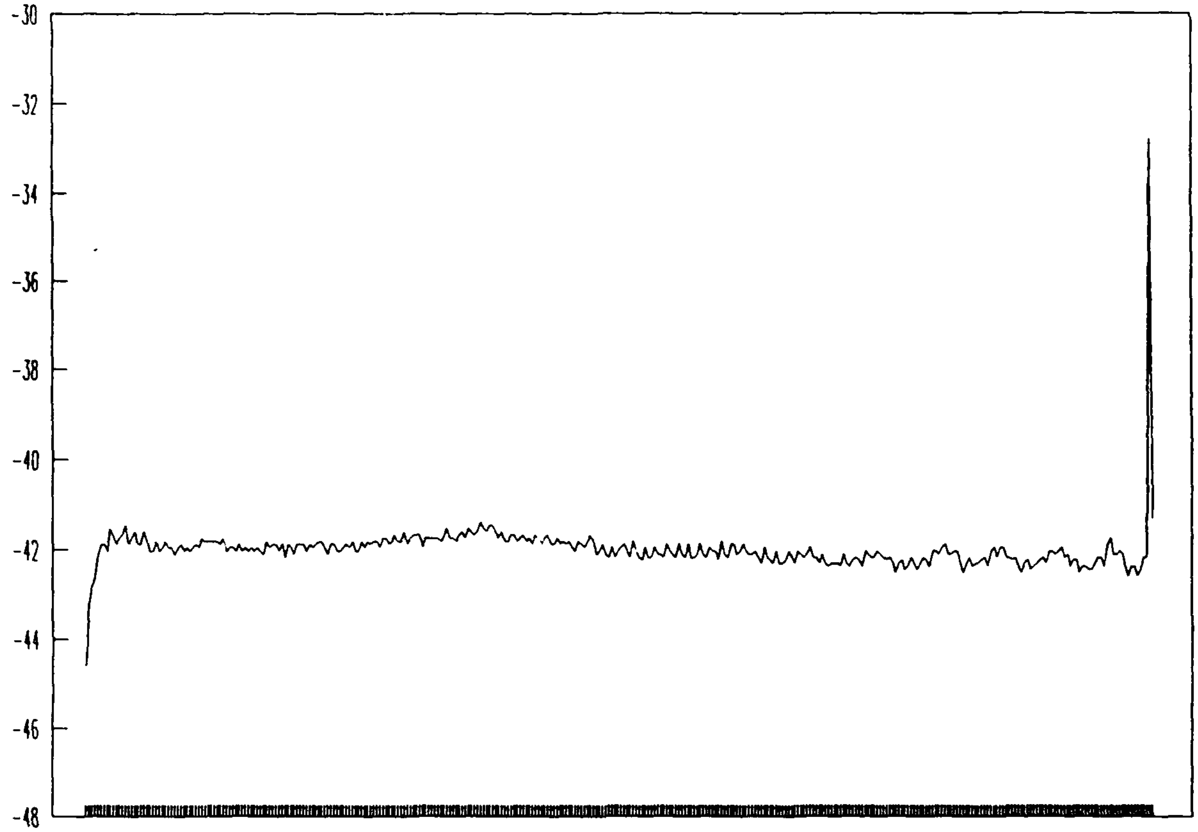
BLOOD CONTROLLED AT 70°C



~~1.06μm Nd:YAG~~ KTP
small aperture

SEP 27 S

BLOOD CONTROLLED AT 80°

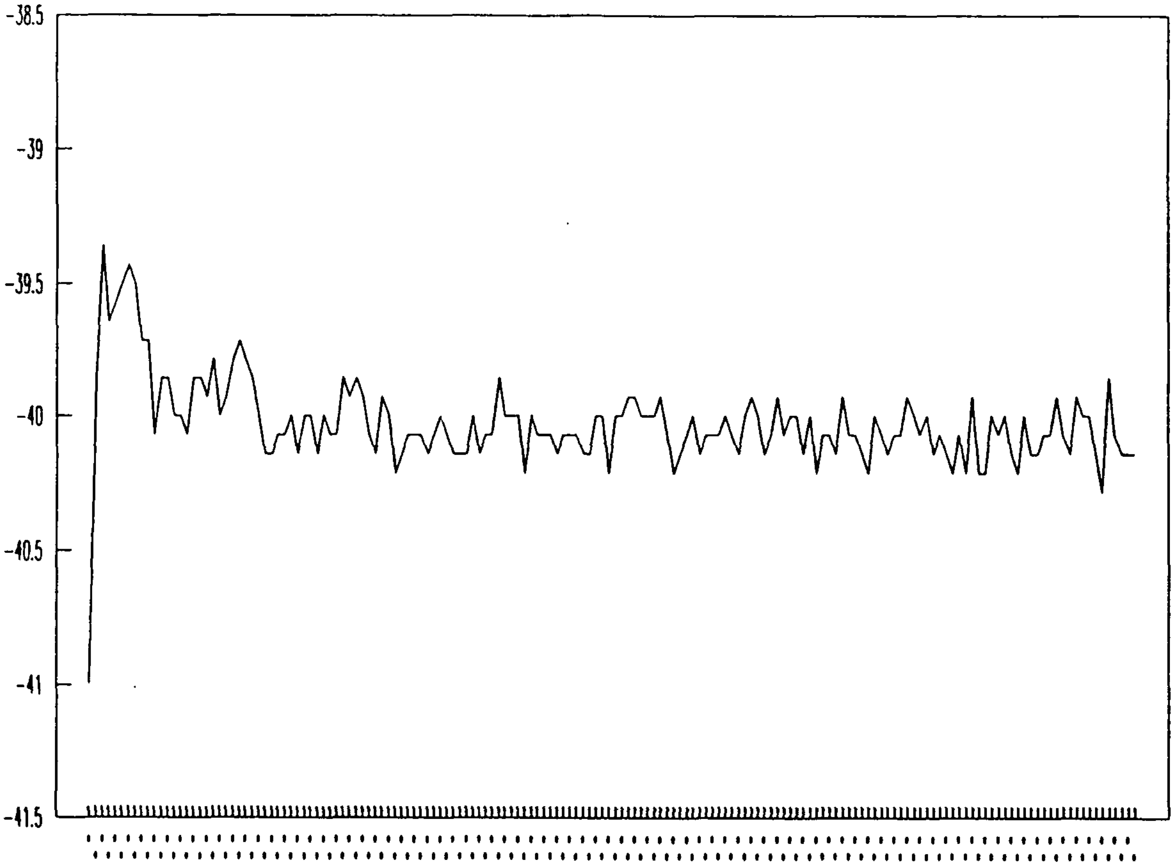


~~1.06μm Nd:YAG~~ KTP

SEP 27T

small aperture

BLOOD CONTROLLED AT 100°C

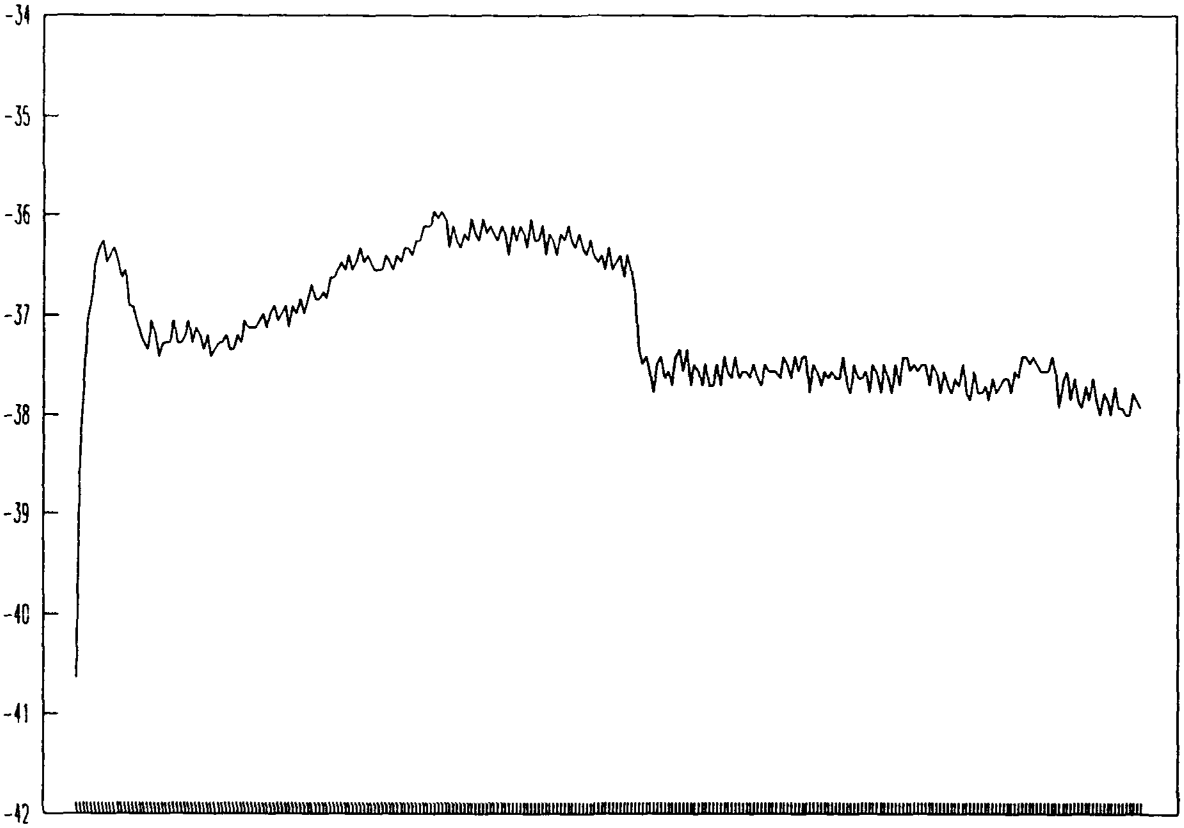


~~1.06μm Nd:YAG~~ KTP

small aperture

BLOOD CONTROLLED AT 100°C

SEP 27U

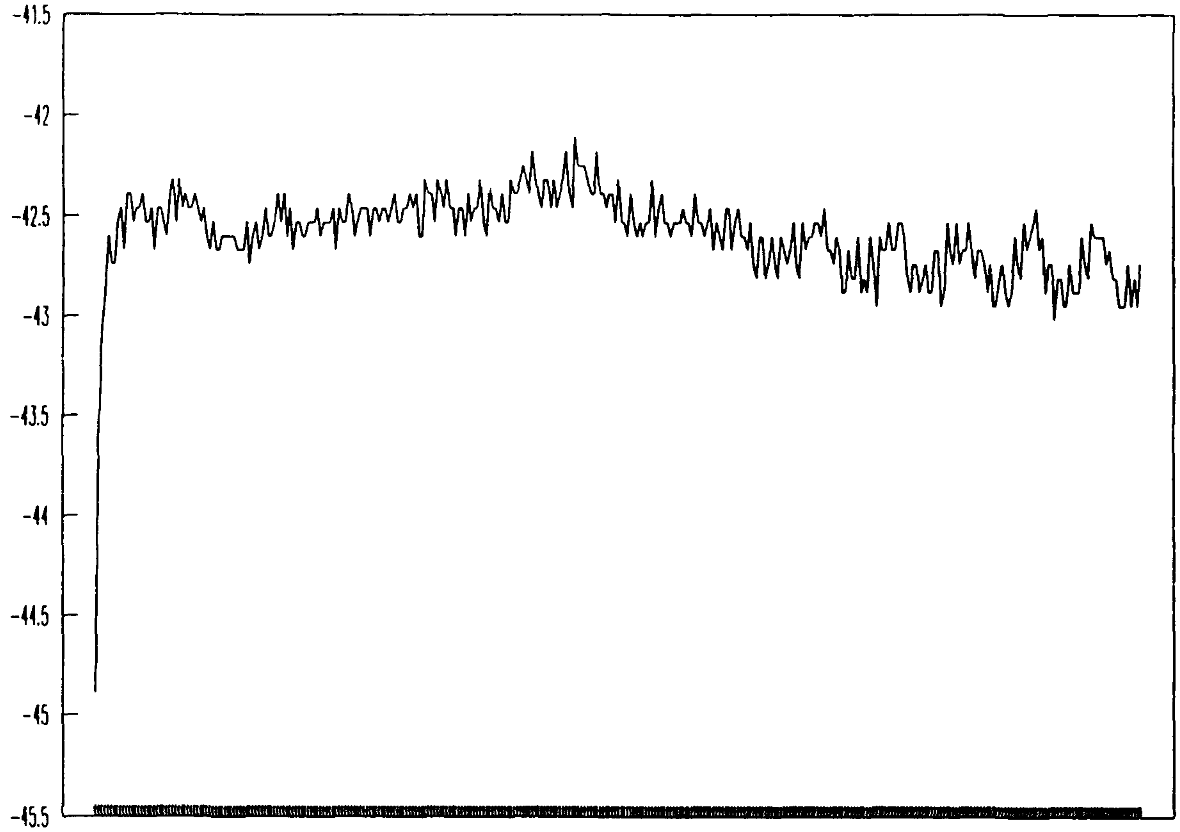


~~1.06μm Nd:YAG~~ KTP

small aperture

SEP 27 V

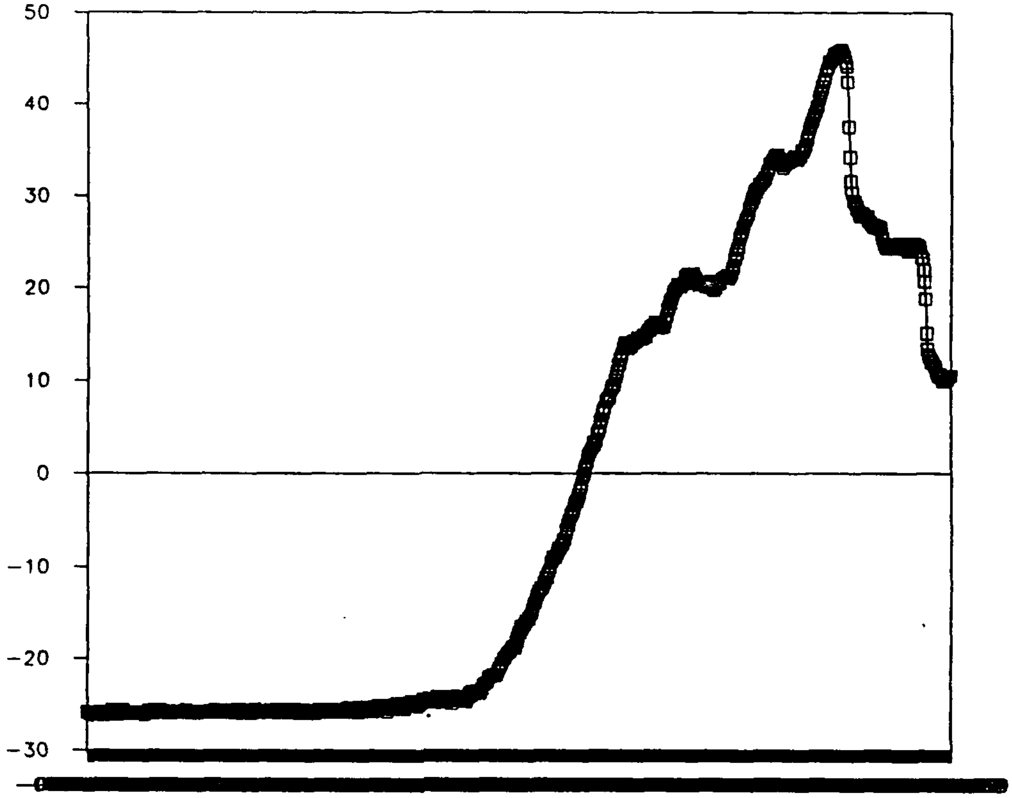
BLOOD CONTROLLED AT 100°C



1.06 μm Nd:YAG
small aperture

ONE STRIP
~~ICG~~ UNWELDED CONTROL

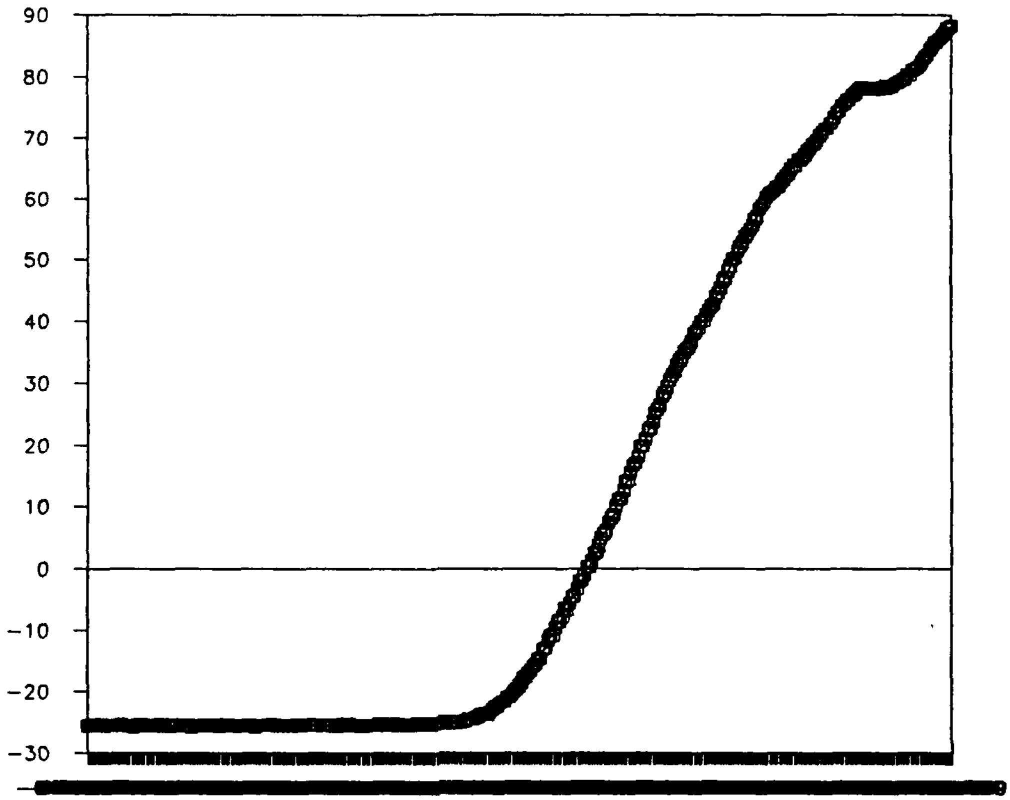
SEP28I



06μm Nd:YAG
small aperture

SEP 28 J

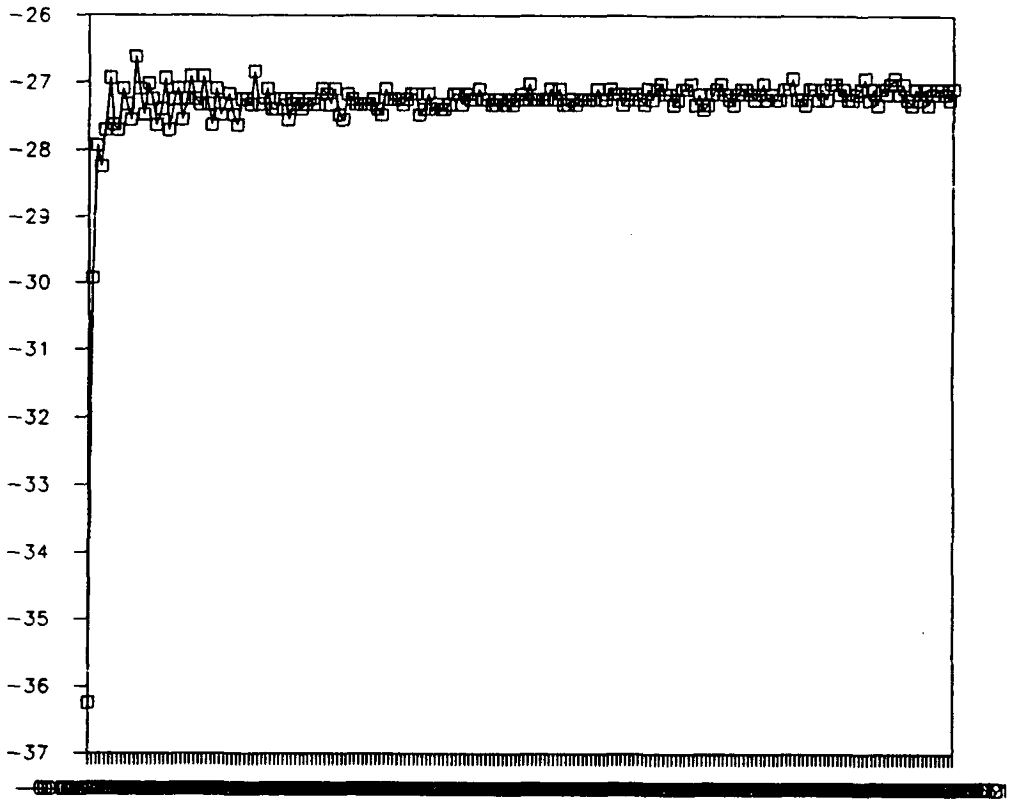
ONE STRIP
~~1CG~~ UNWELDED CONTROL



1.06 μm Nd:YAG
Small aperture

SEP 28 K

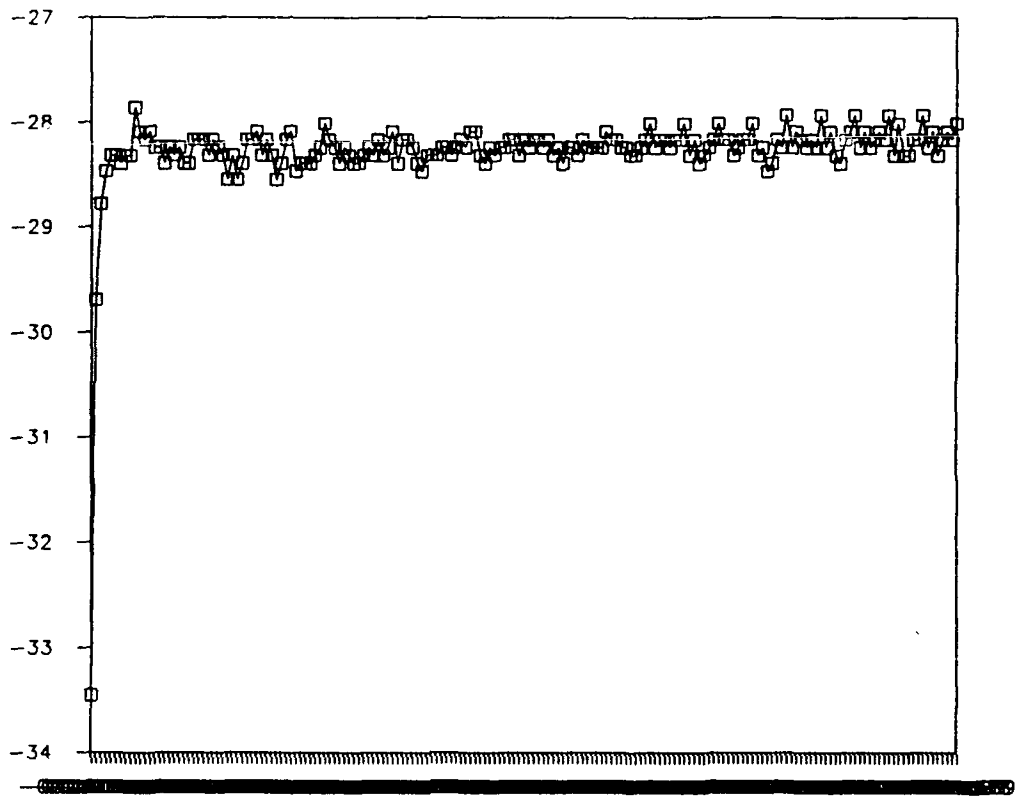
TWO STRIP UNWELDED CONTROL



1.06μm Nd:YAG
Small aperture

SEP 28L

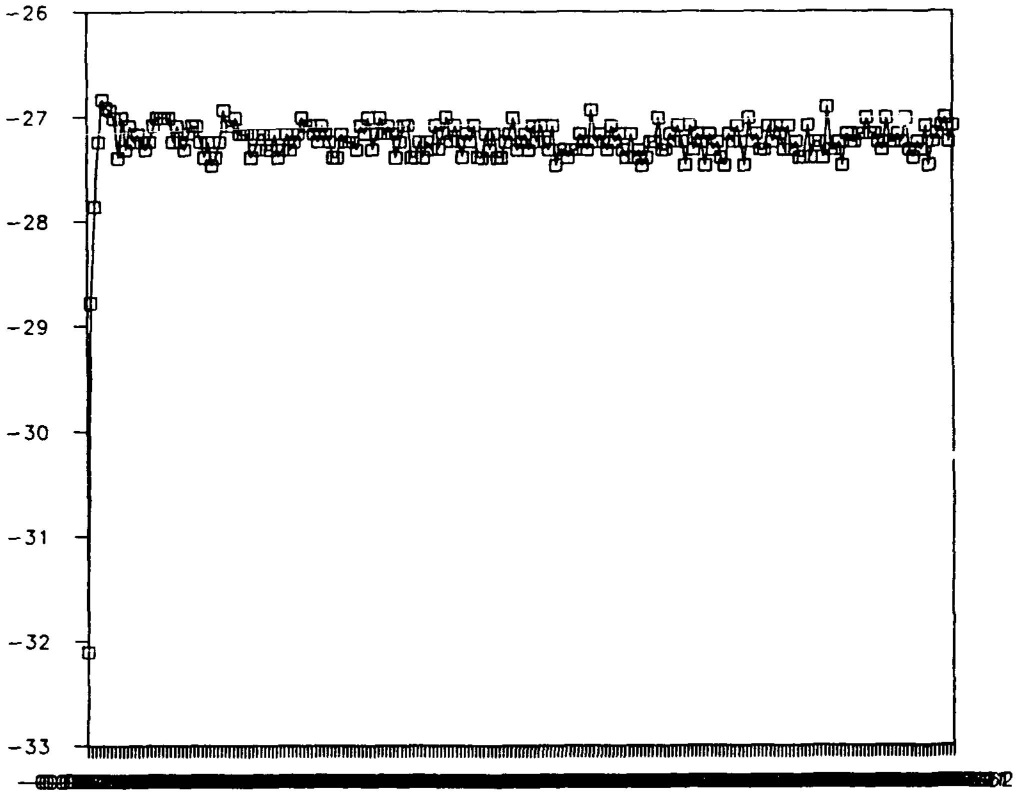
TWO STRIPS ICG UNWELDED CONTROL



1.06 μm Nd:YAG
Small aperture

SEP 28M

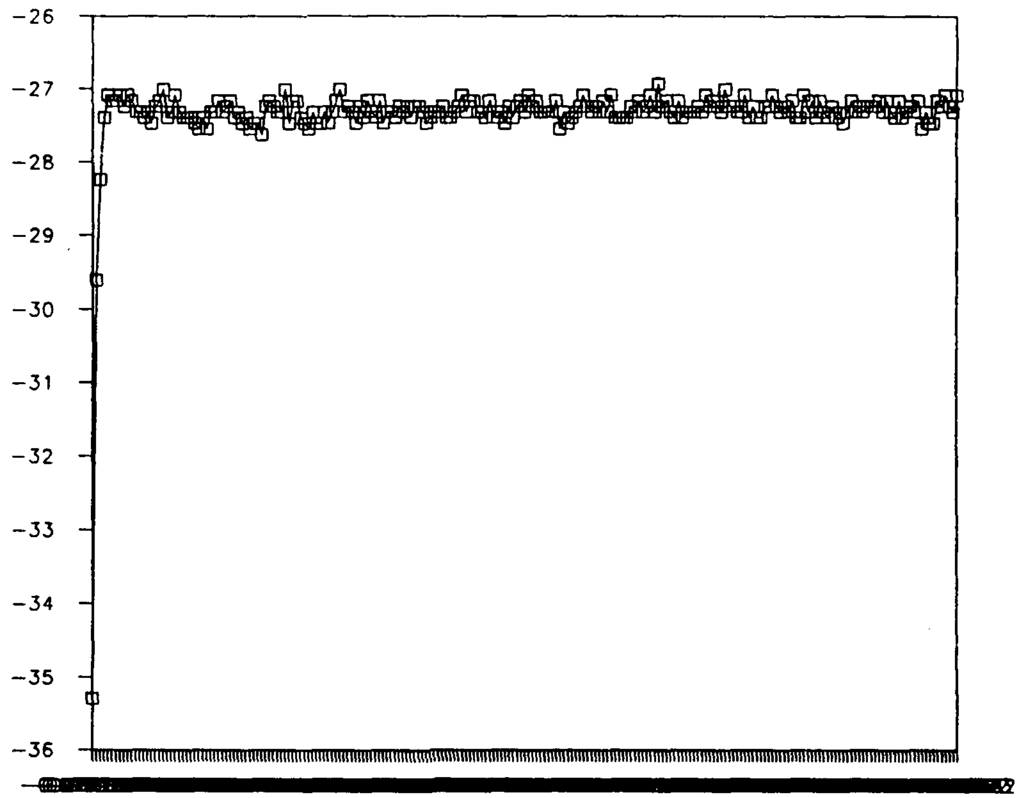
ICG CONTROLLED AT 50°C



1.06 μm Nd:YAG
small aperture

SEP 28 N

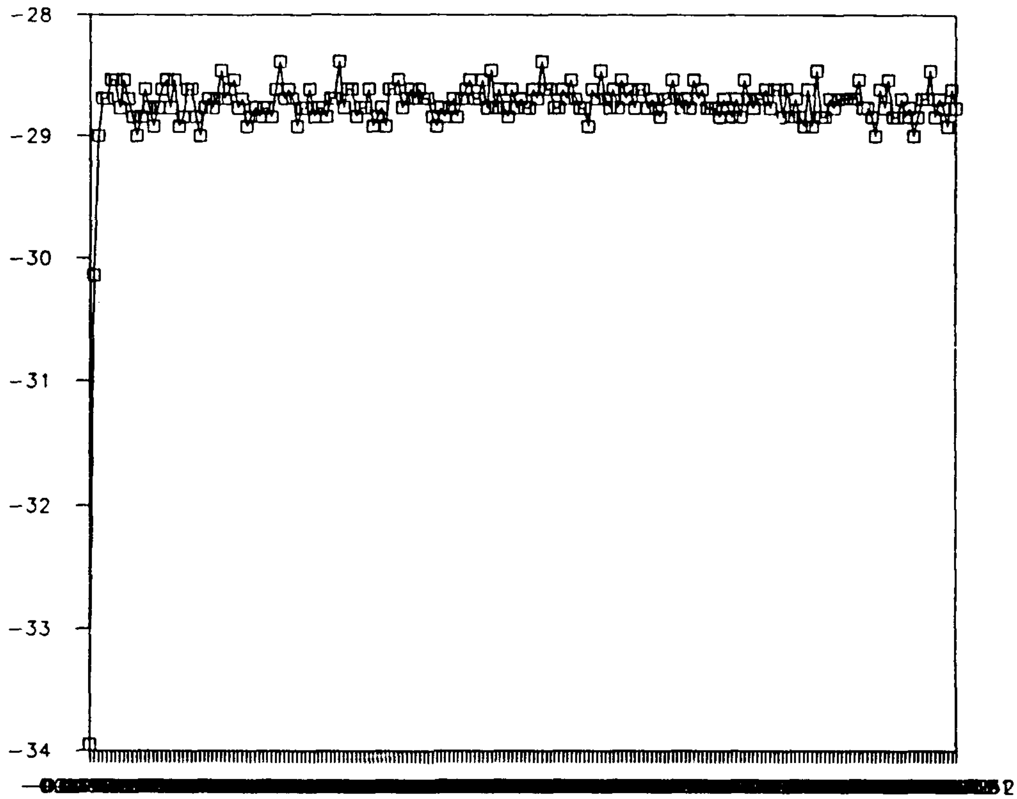
ICG CONTROLLED AT ~~50°C~~ 60°C



1.06 μm Nd: YAG
Small aperture

SEP 28 '90

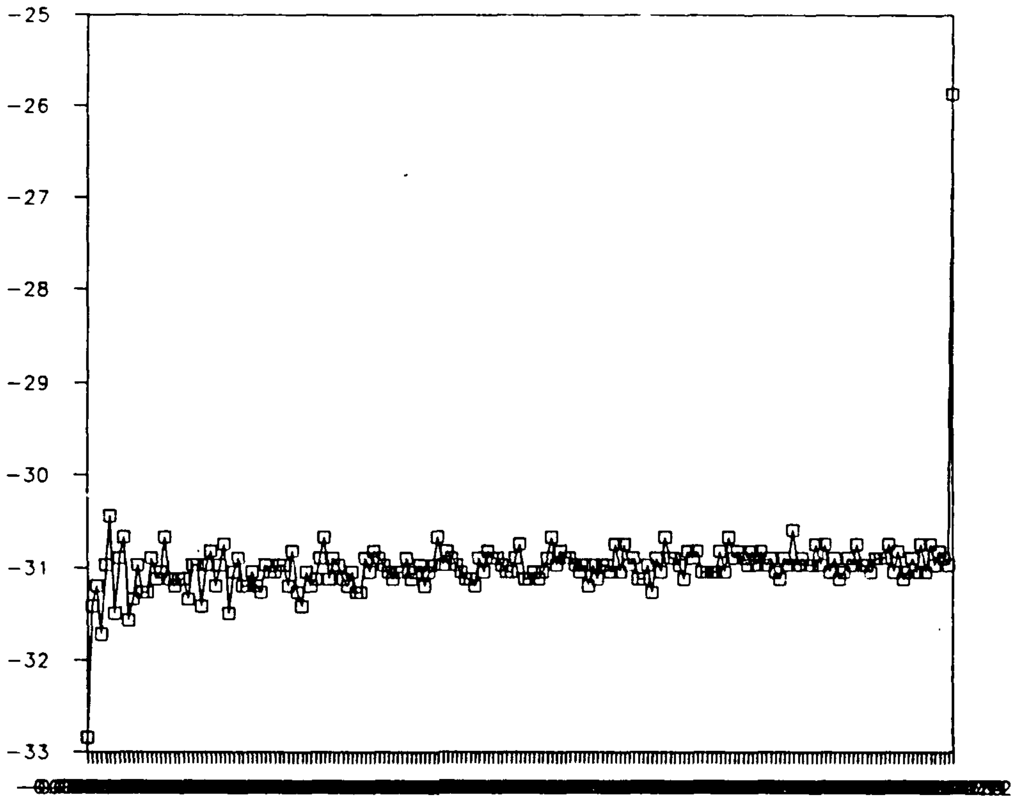
ICG CONTROLLED AT 70°C



1.06µm Nd:YAG
small aperture

SEP 28P

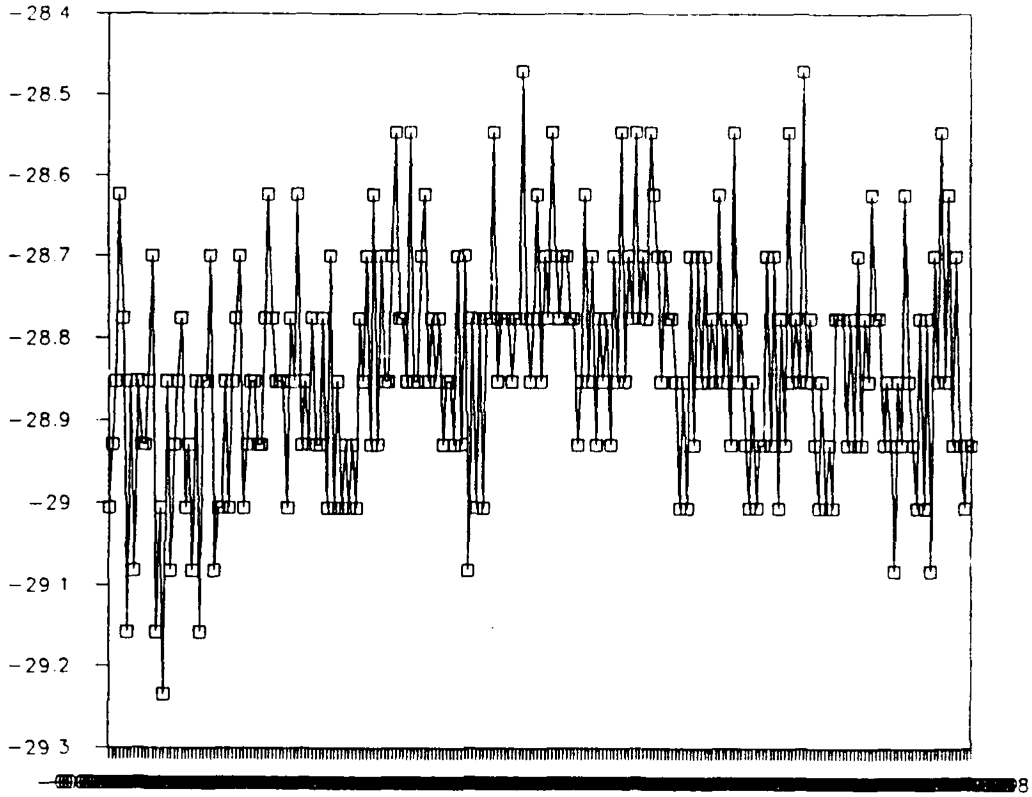
ICG CONTROLLED AT 80°C



1.06 μm Nd:YAG
small aperture

KCG CONTROLLED AT 100°C

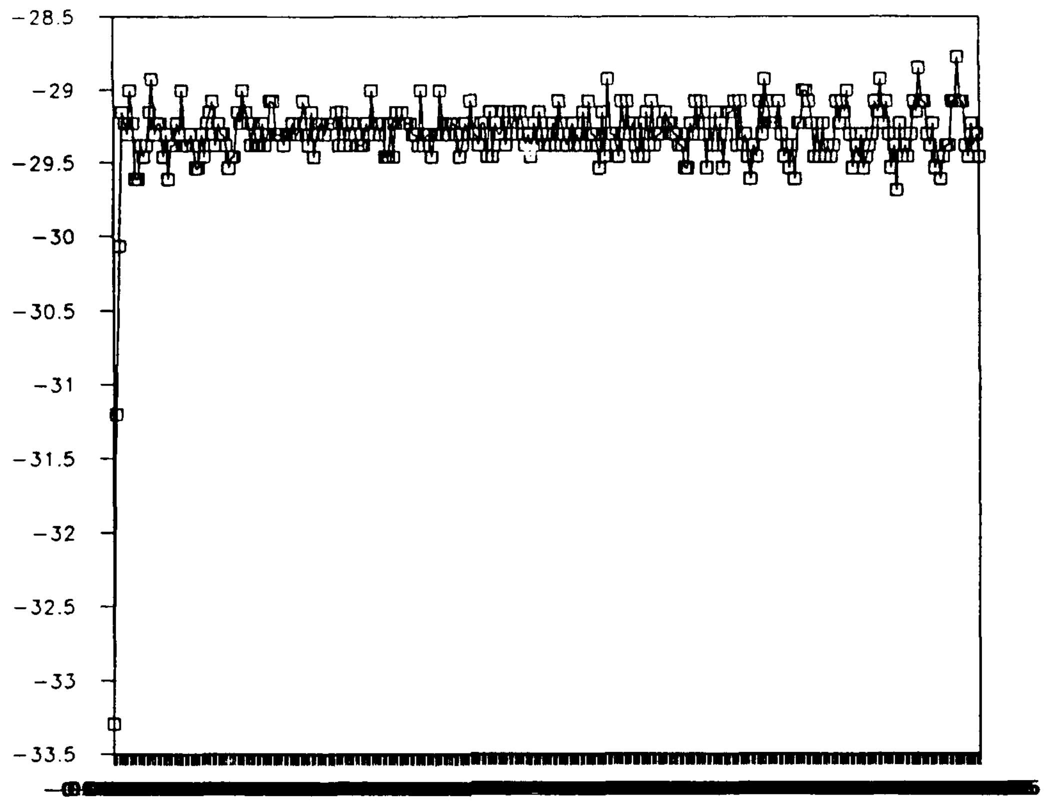
SEP 28 Q1



1.06 μm Nd:YAG
small aperture

ICG CONTROLLED AT 100°C

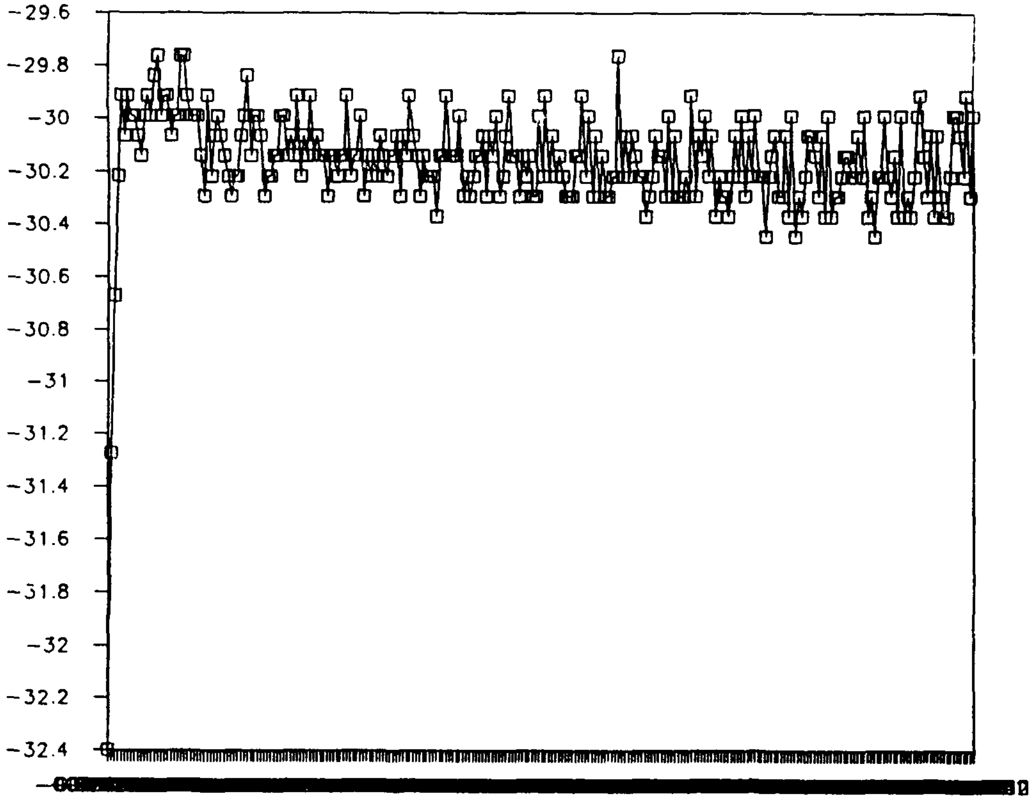
SEP 28 R



1.06 μm Nd:YAG
small aperture

INDIA INK CONTROLLED AT 80°C

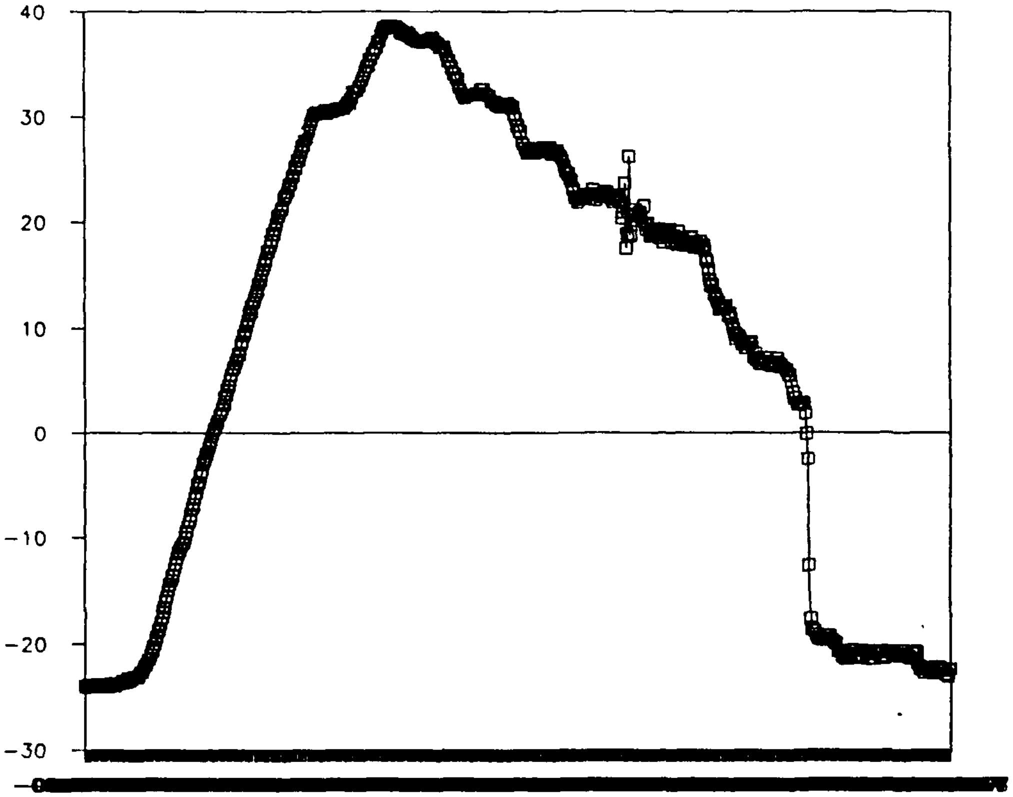
SEP 28 S



1.06 µm Nd:YAG
small aperture

SEP28T

ONE STRIP CONTROL



OCT 9, 1990

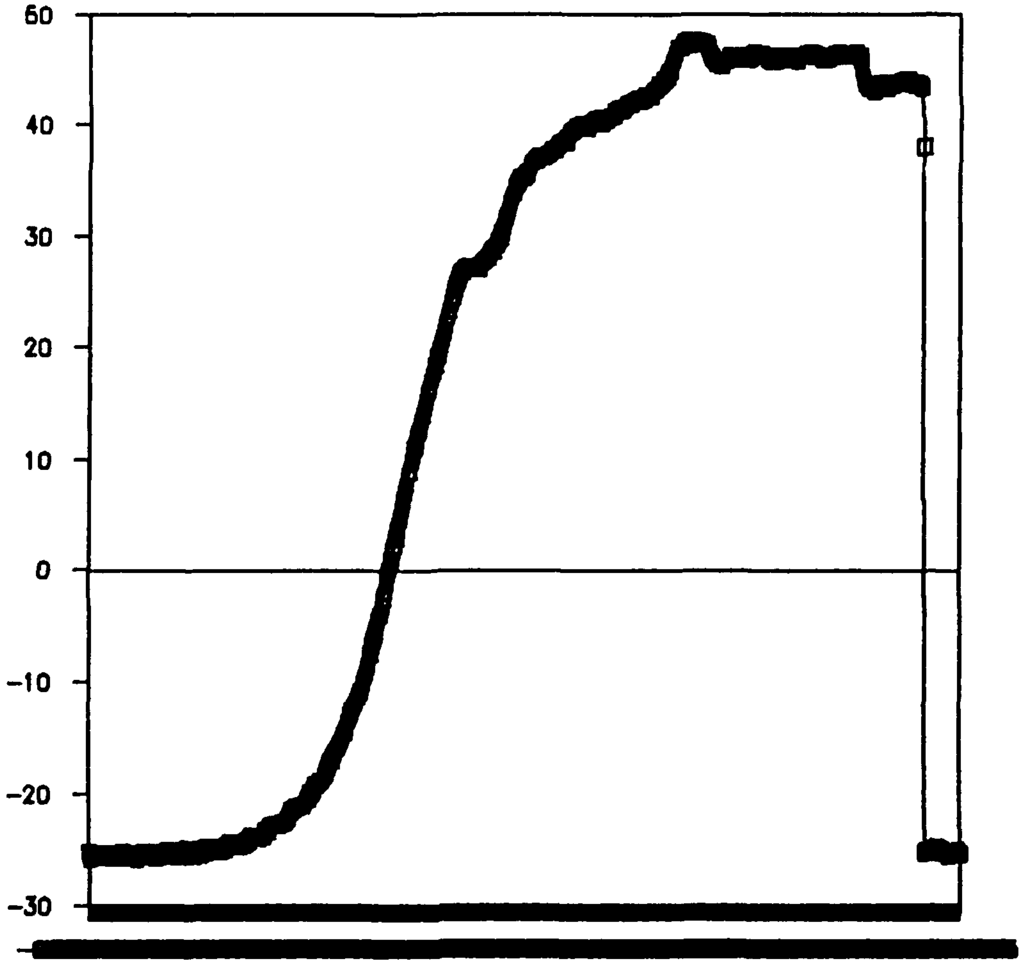
KTP laser → 20W out of laser → 4.0 W delivered

Small Aperture

Ferronyl - $\frac{\text{1g Ferronyl}}{\text{3ml 0.9\% Saline}}$

Ferronyl + Blood - $\frac{\text{1g Ferronyl}}{\text{3 ml Whole blood in EDTA}}$

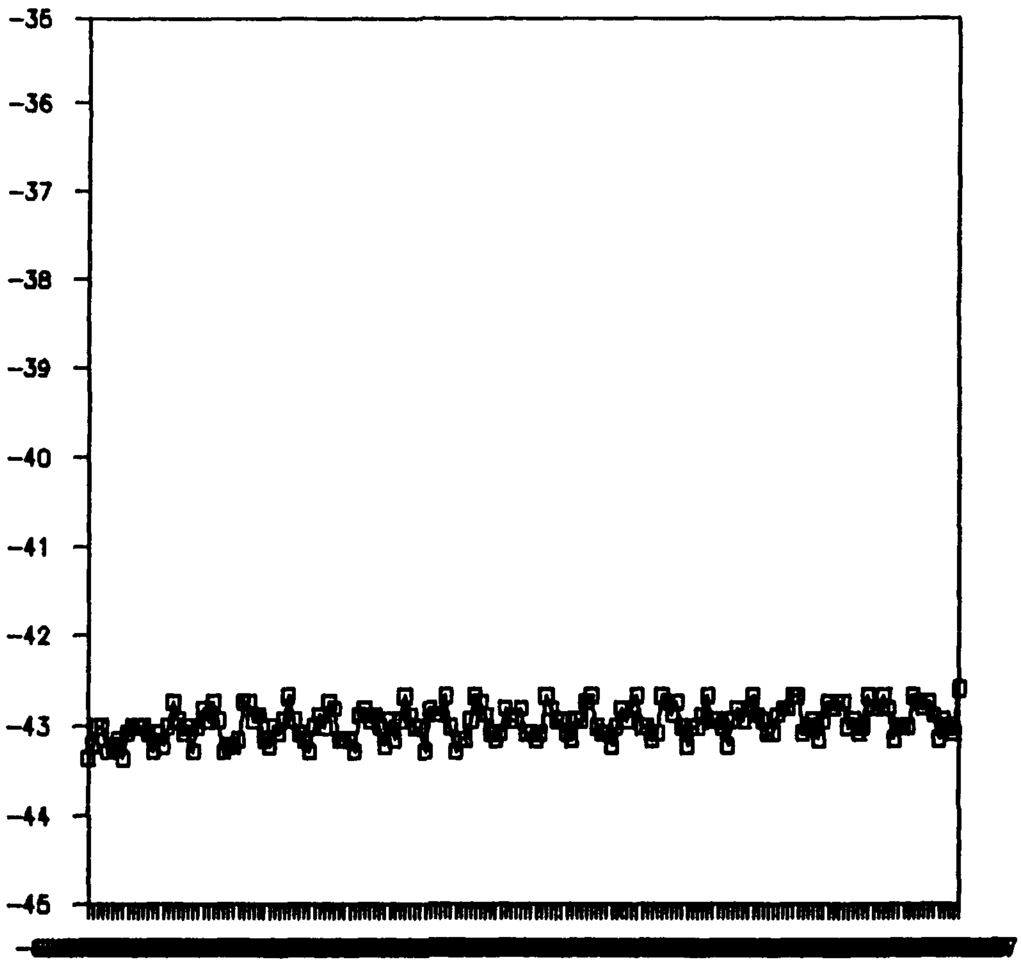
OCT9A



KTP - one step unwelded control

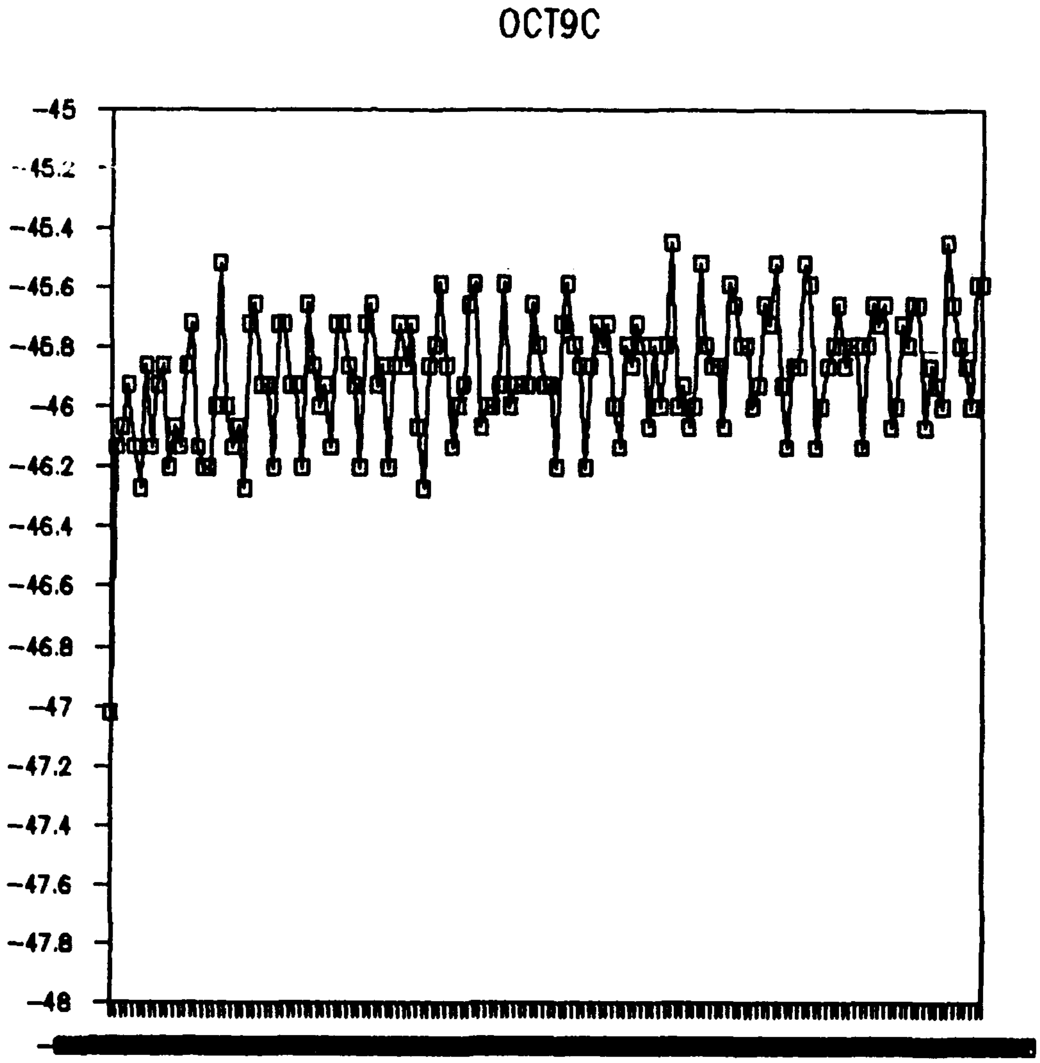
small aperture

OCT9B



KTP - two strip unwelded
control

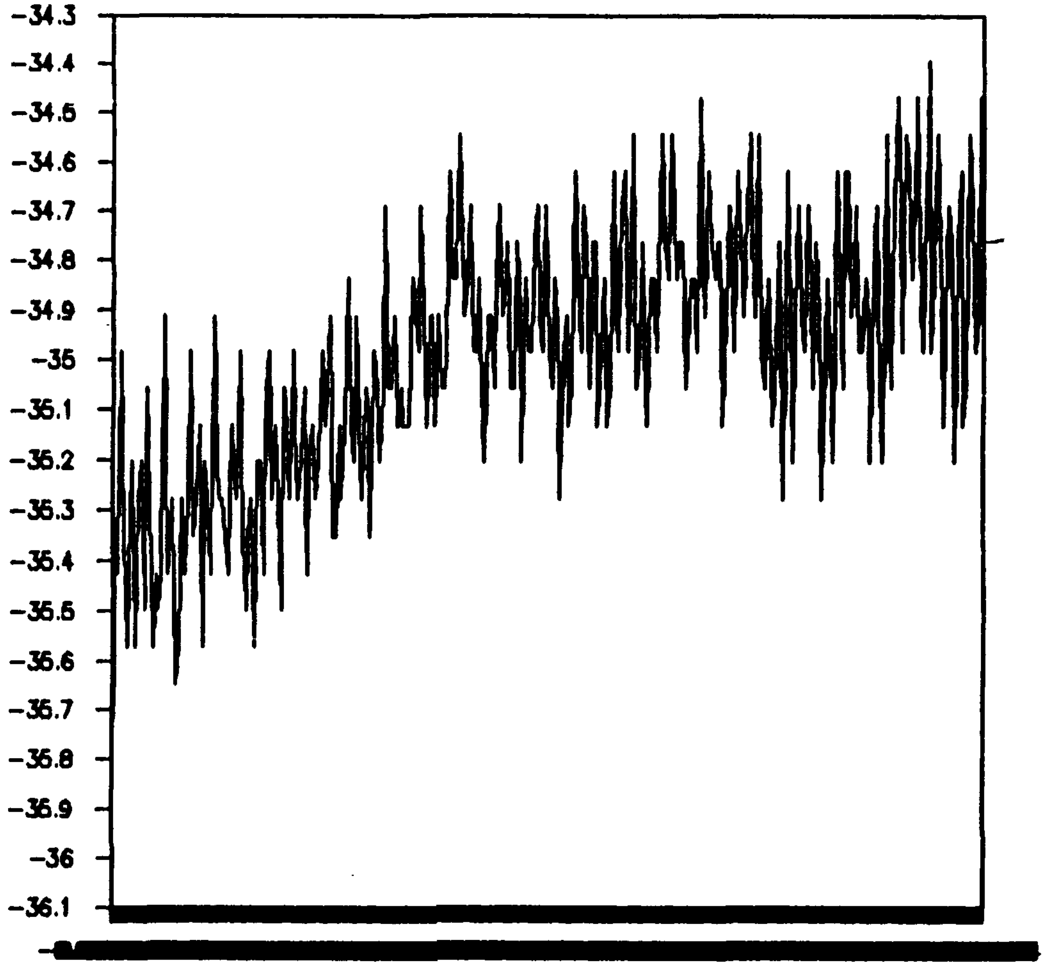
small aperture



KTP – two step India ink
unwelded control

small aperture

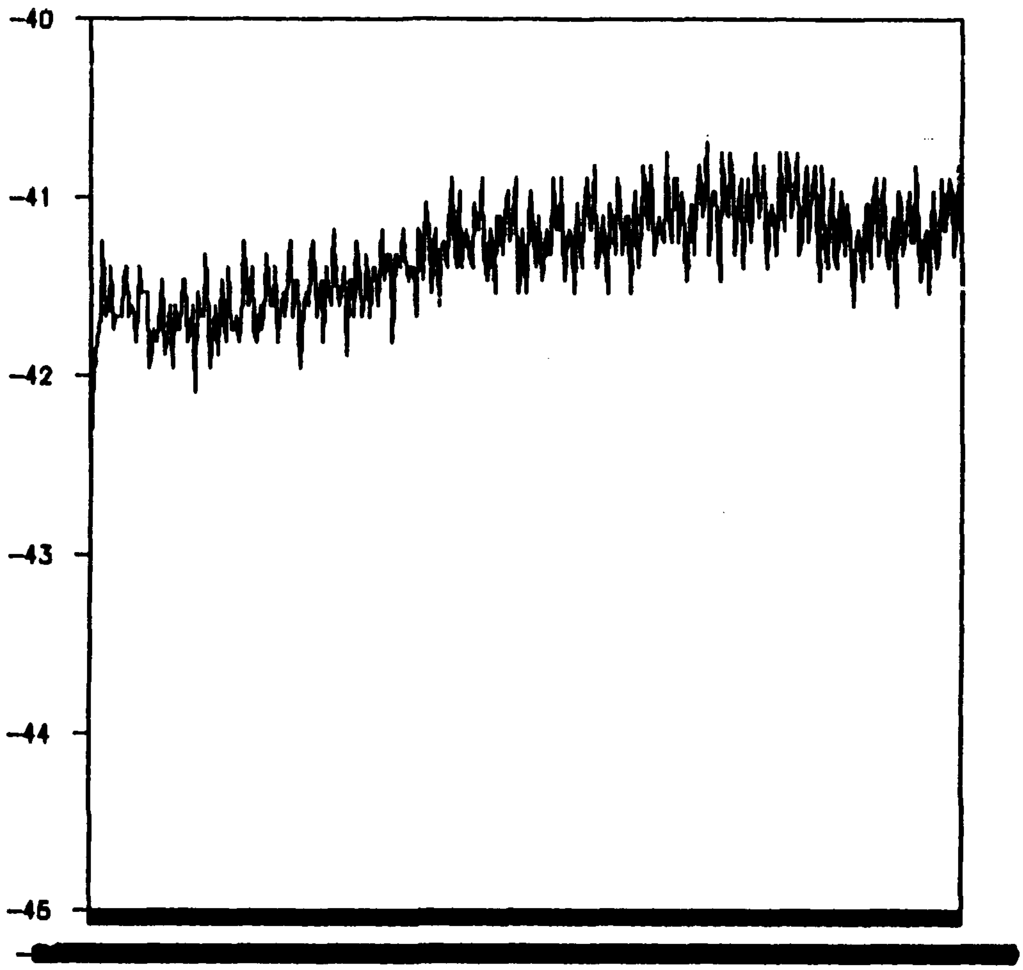
OCT9D



KTP - Indium ink - 50°C

small aperture

OCT9E

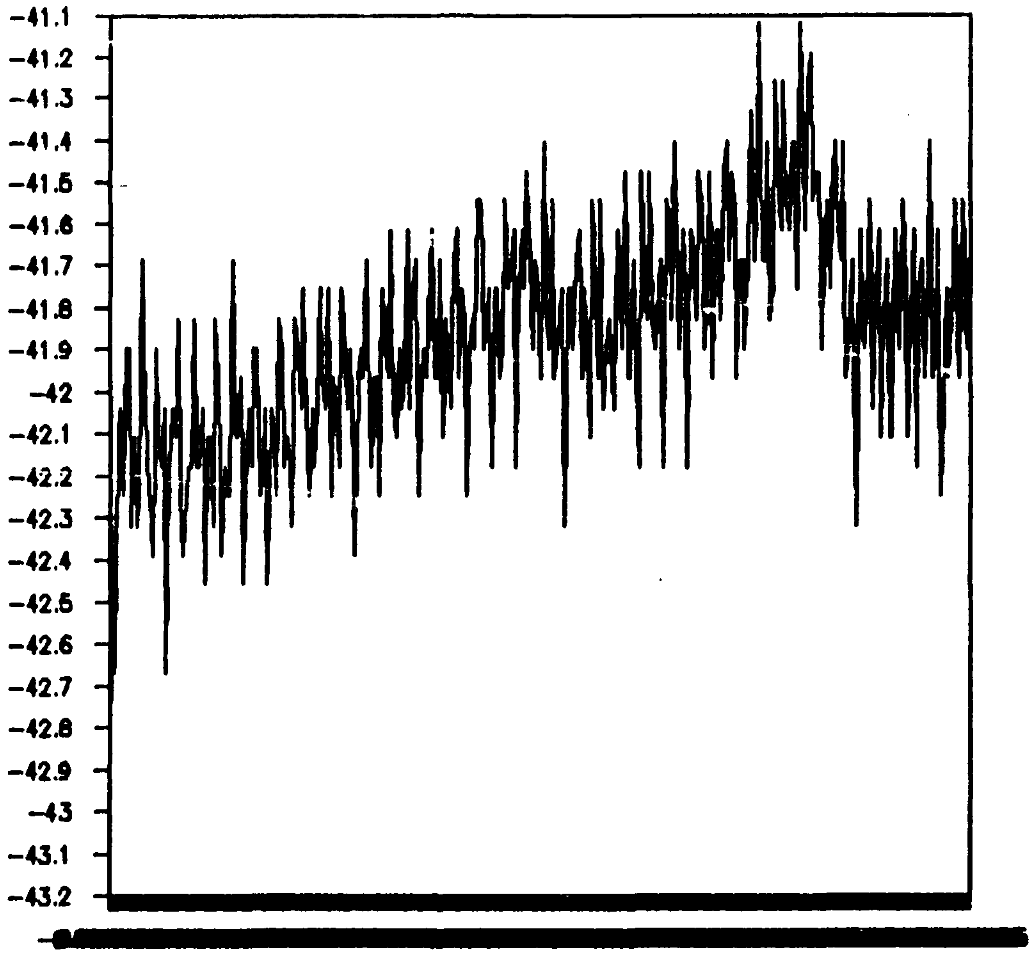


KTP- India ink - 60°C

small aperture

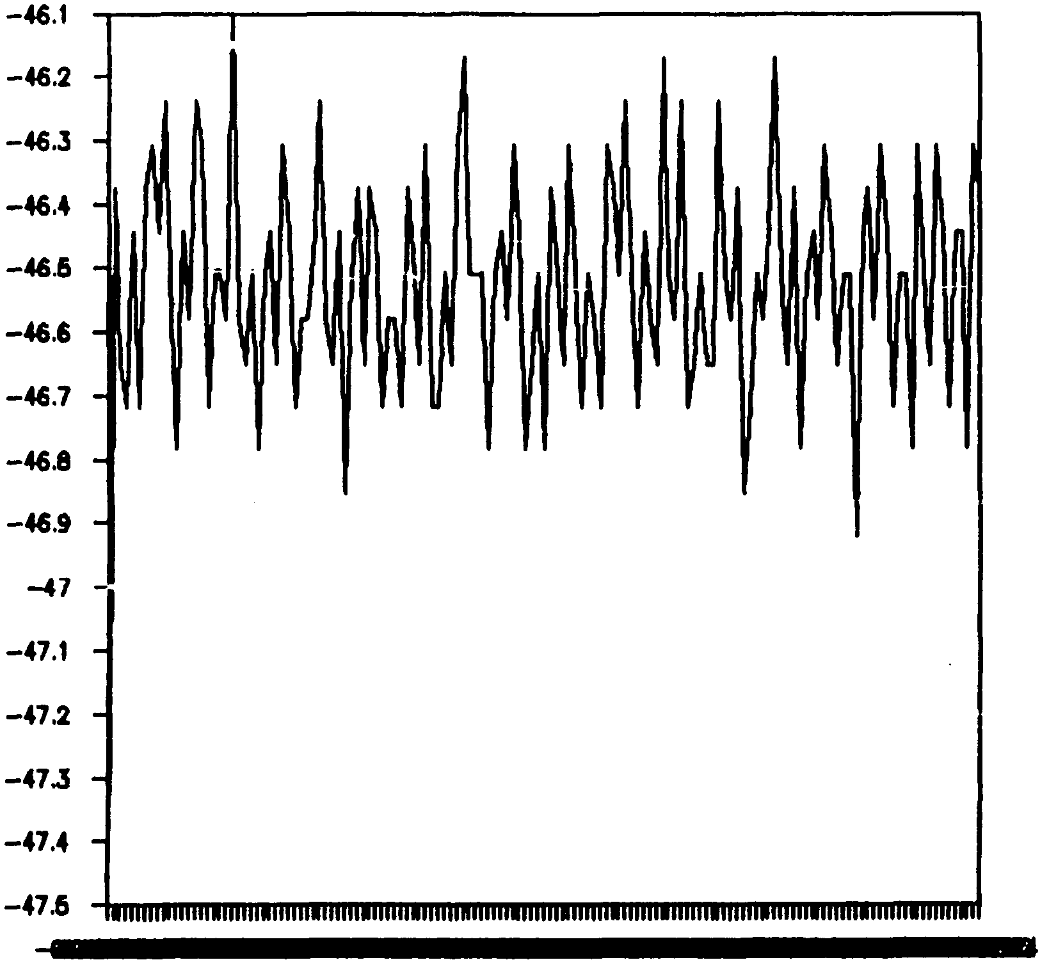
OCT9F

0.79



KTP- India ink- 70°C
small aperture

OCT9G



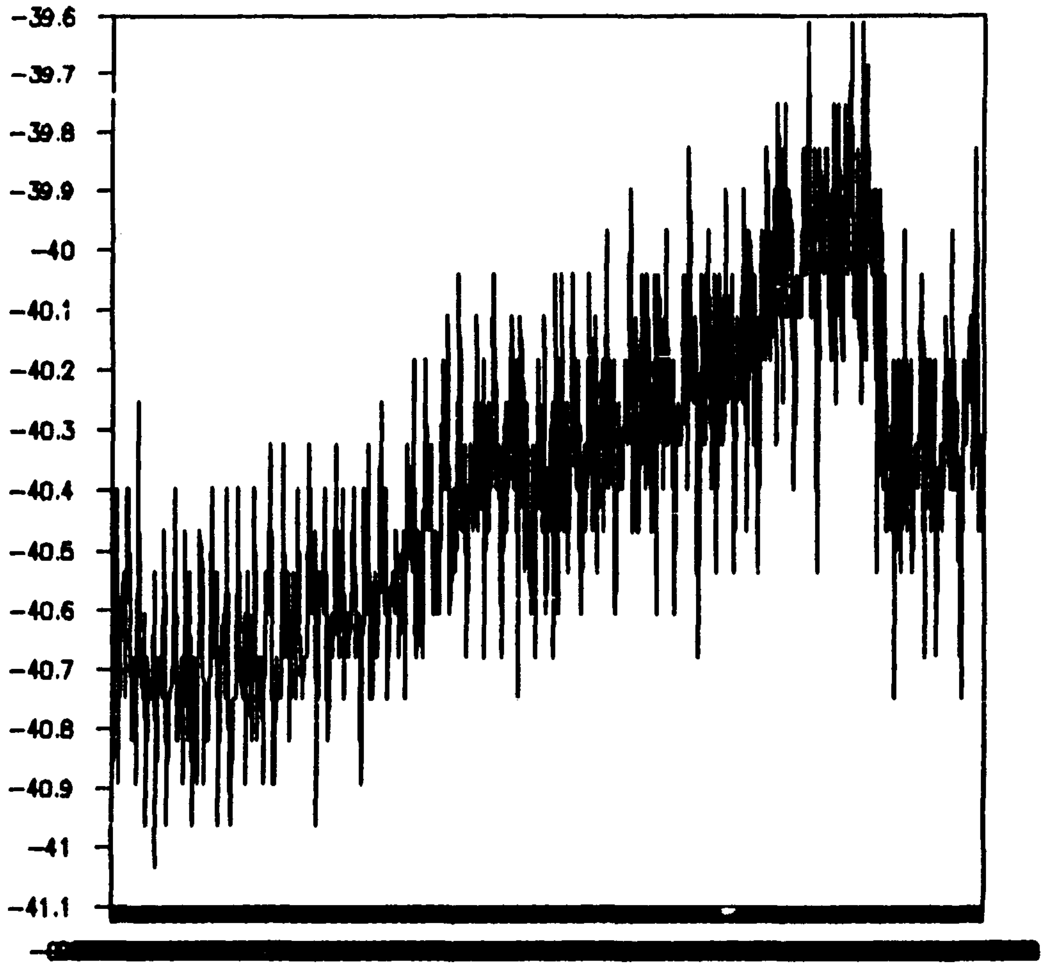
O3

KTP - India ink - 80°C

T_c too superficial ?

small aperture

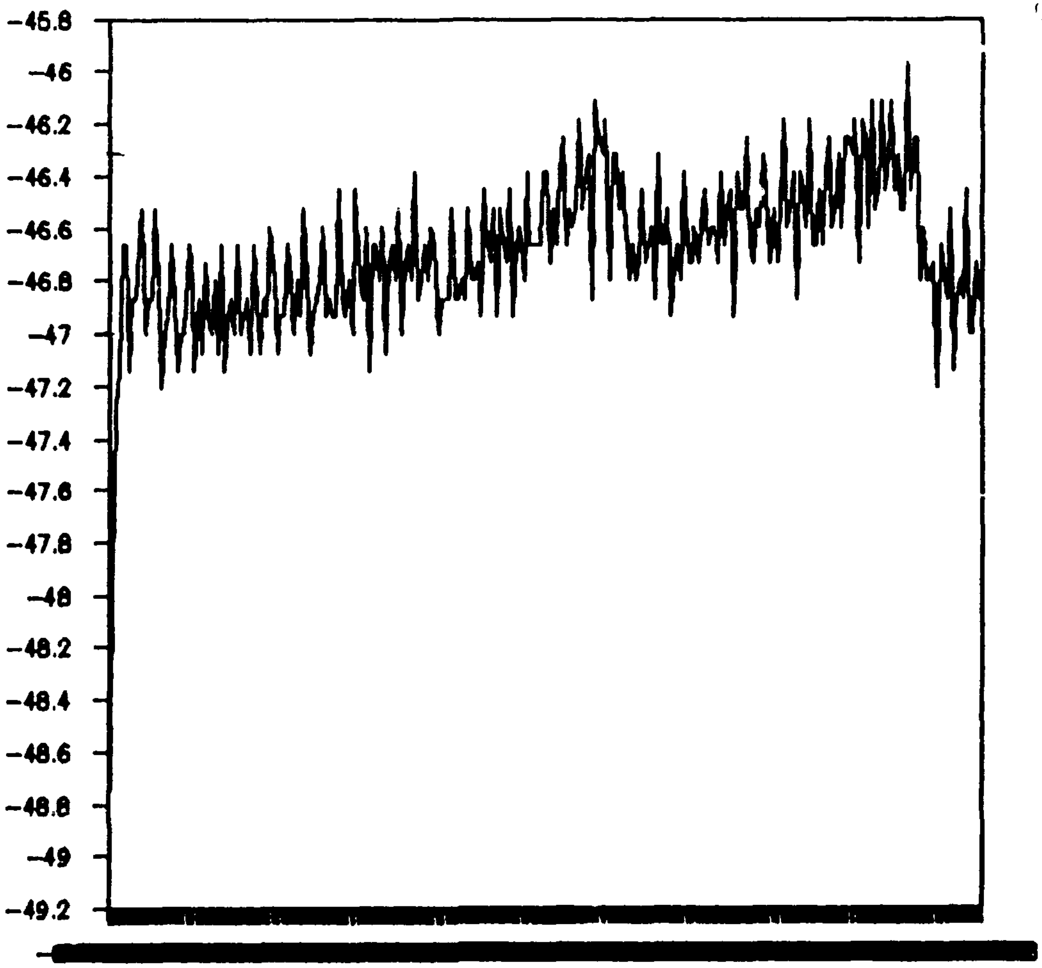
.OCT9H



KTP - India ink - 80°C

small aperture

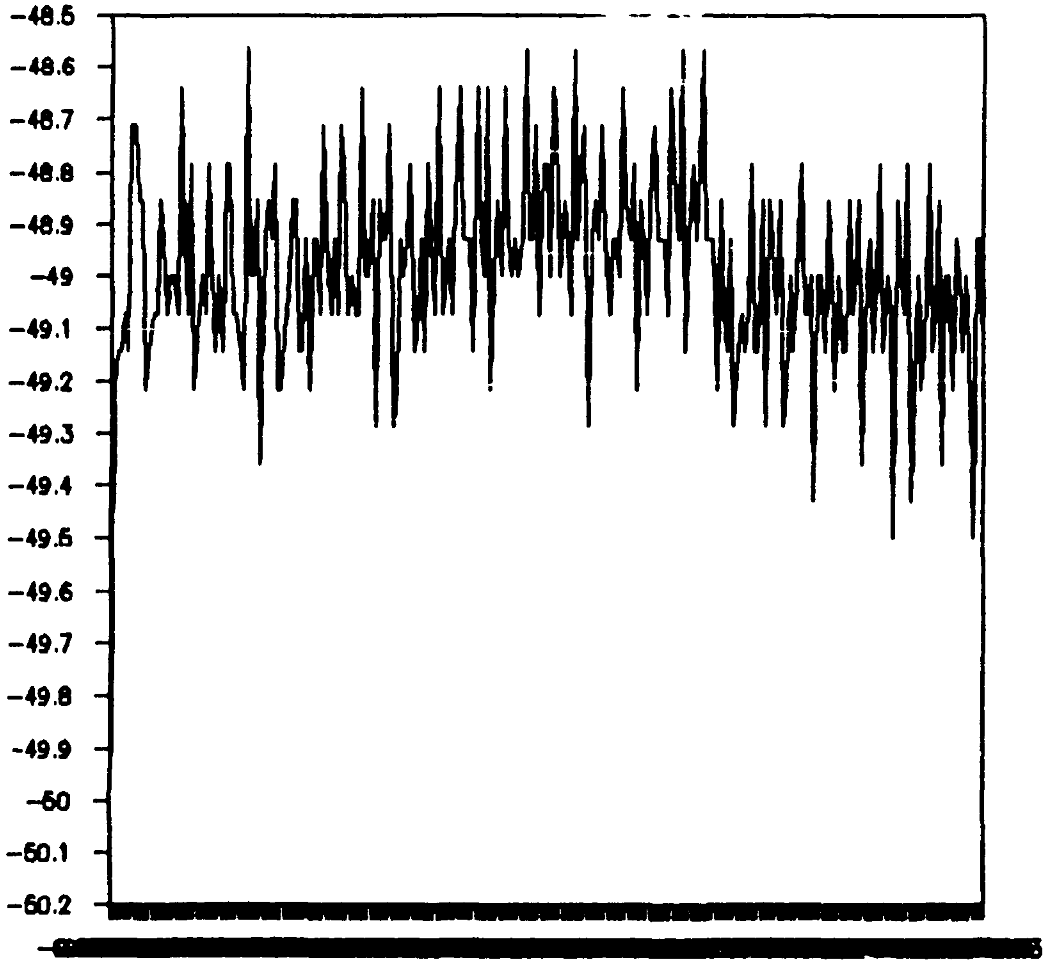
OCT91



KTP - India ink - 100°C

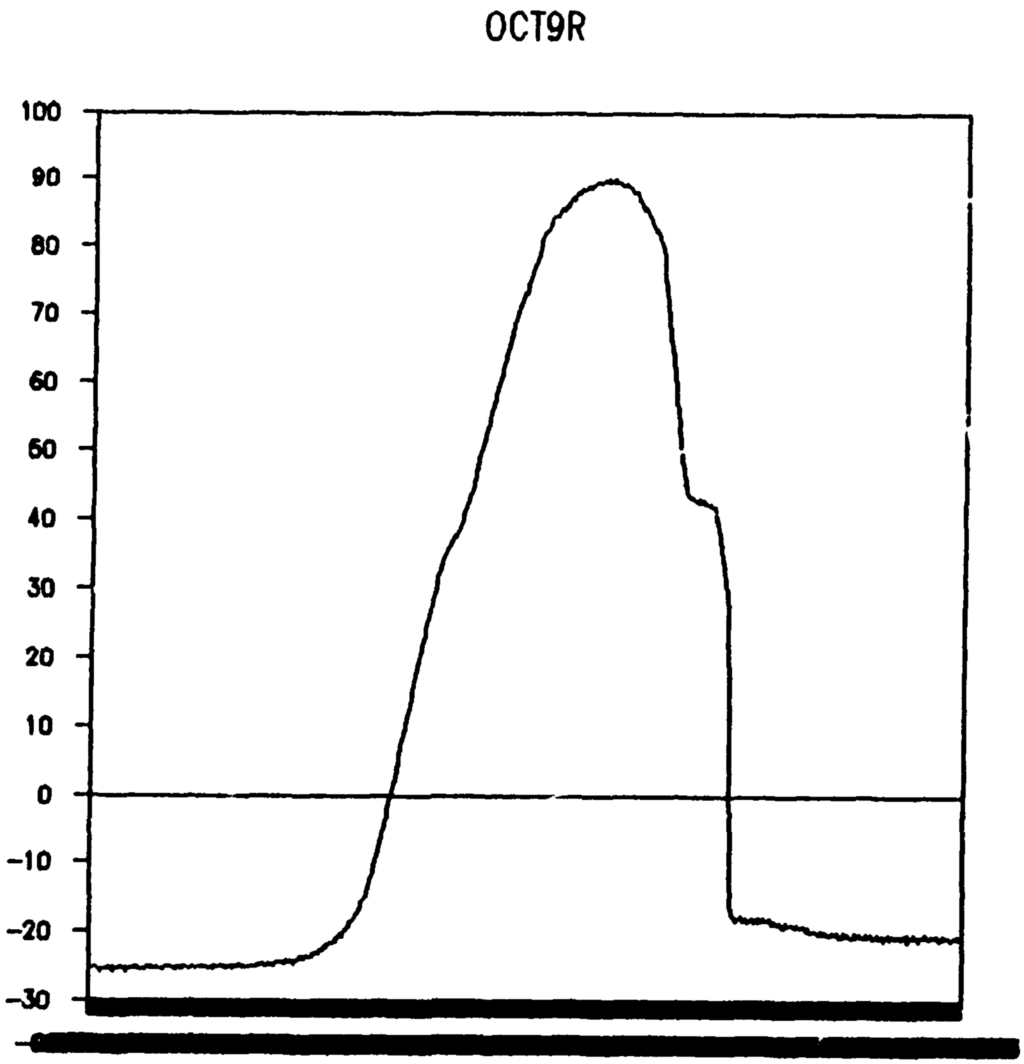
small aperture

OCT9J



KTP - India run -100°C

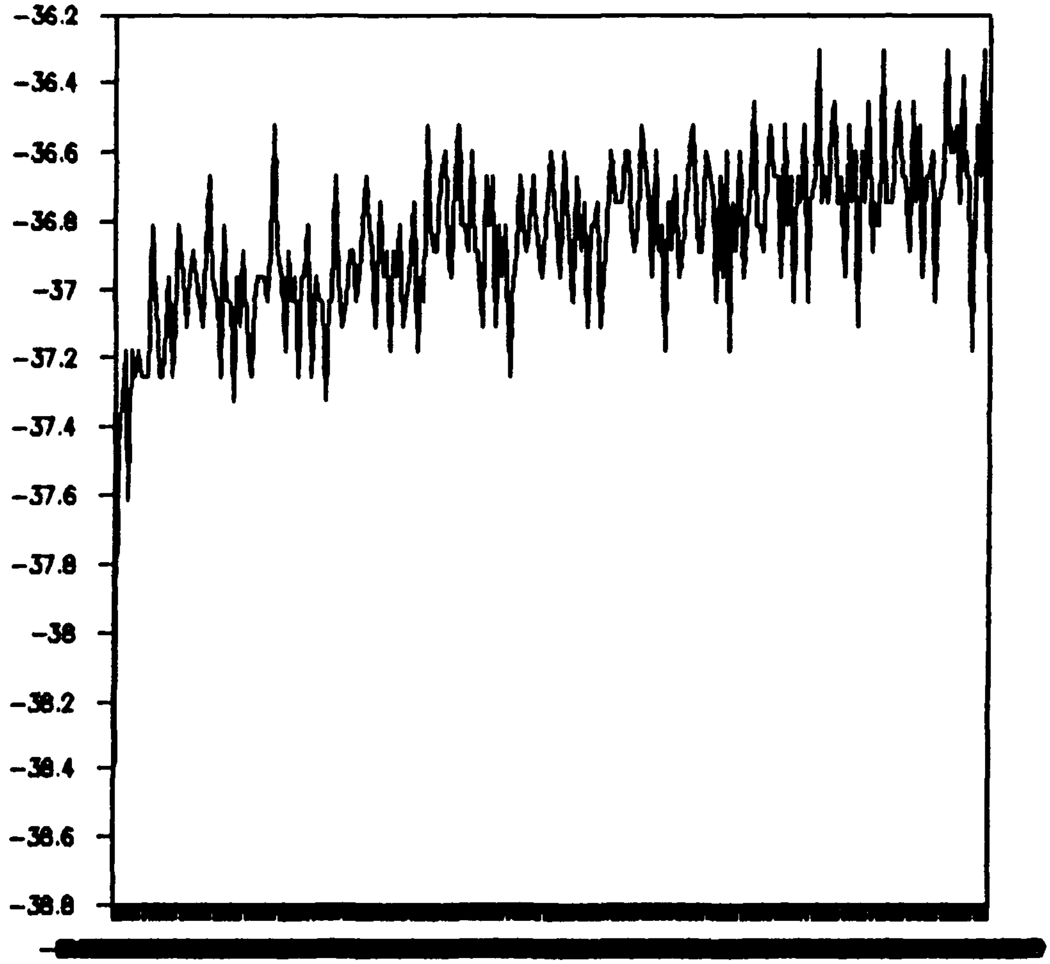
small aperture



KTP - one step control

small aperture

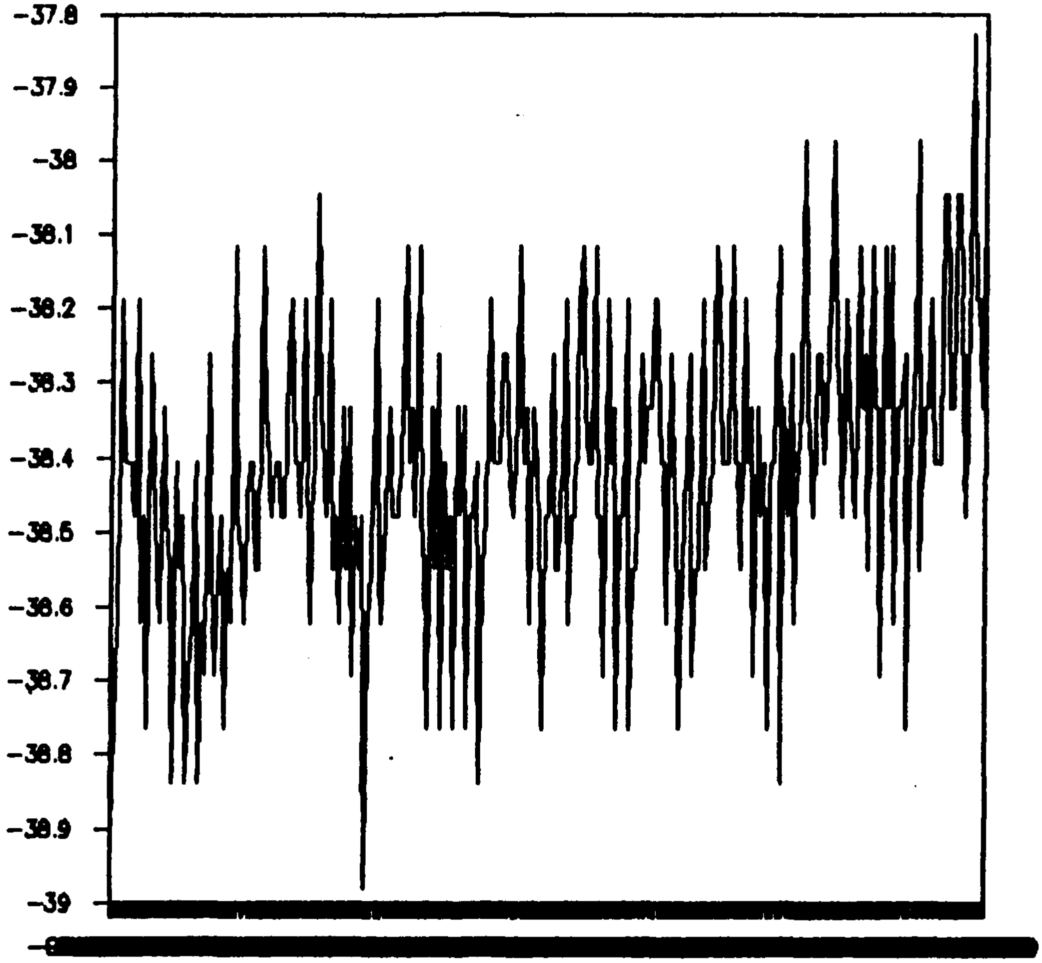
OCT9S



KTP - two strip control

small aperture

OCT9T

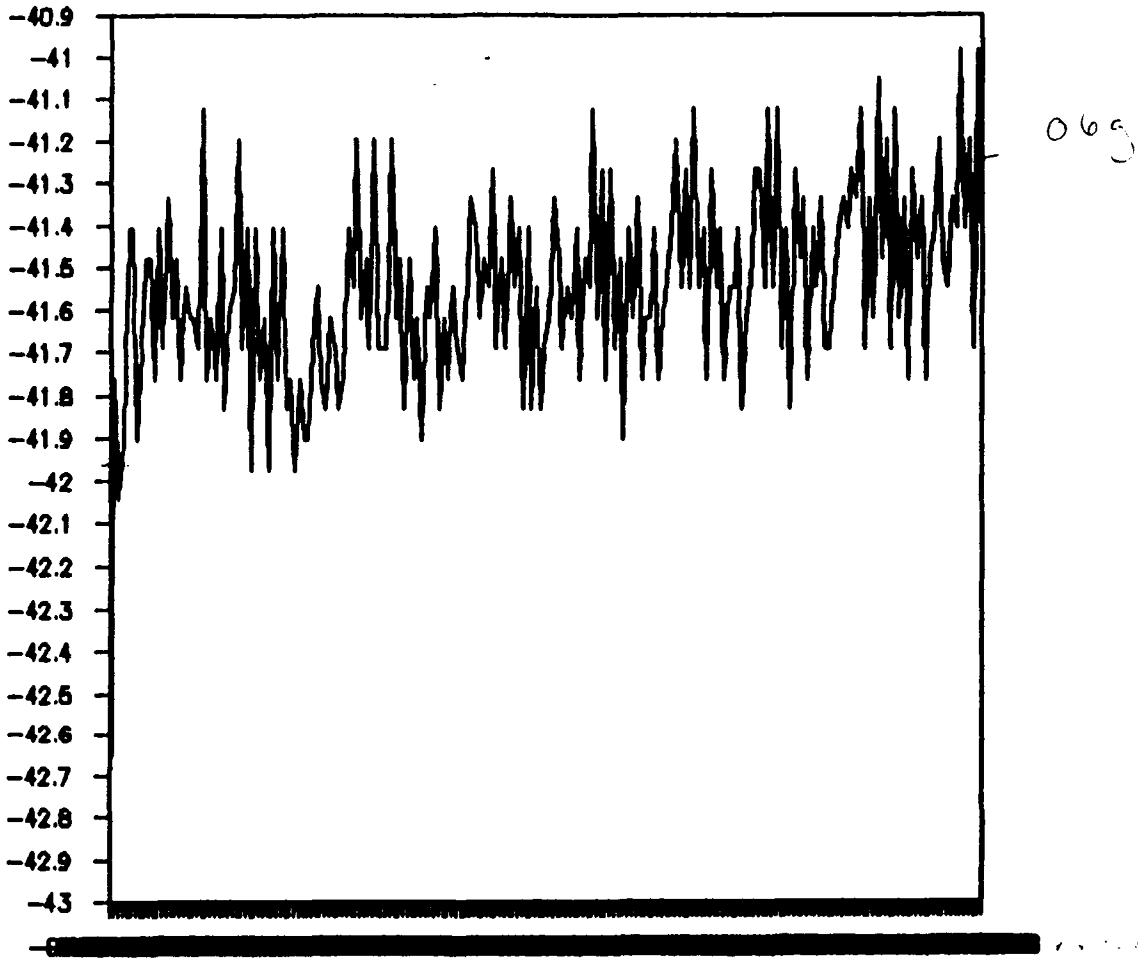


KTP - two strip unwelded blood

control

small aperture

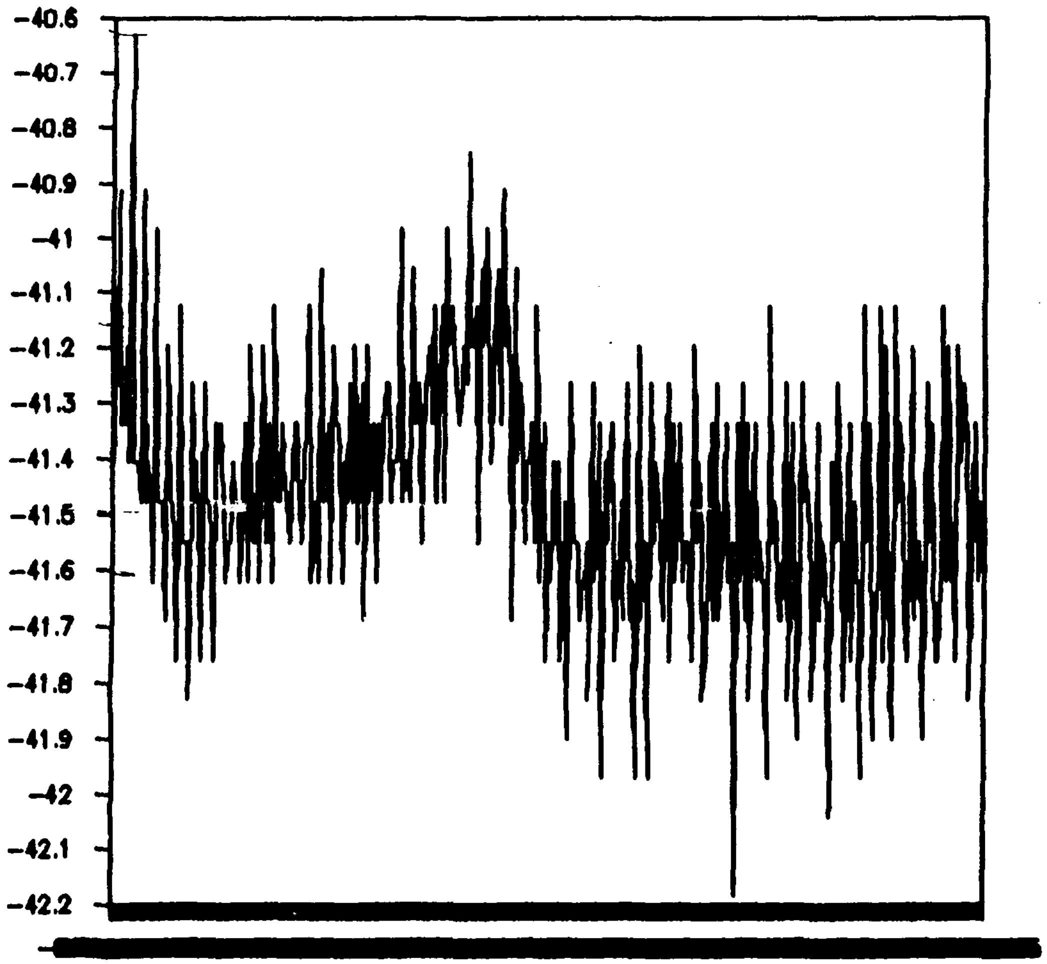
OCT9U



KTP - Blood - 30°C

small aperture

OCT9V1

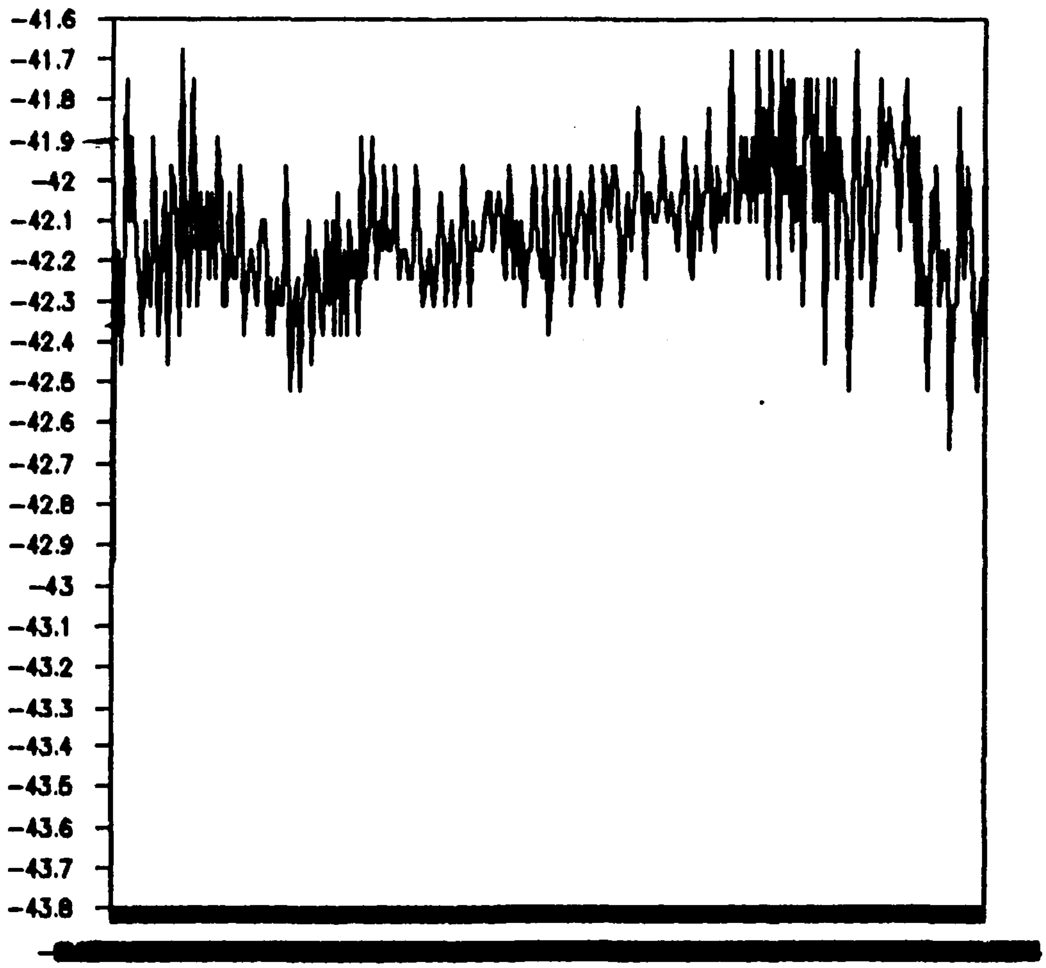


0 ·158

KTP - Blood -60°C

small aperture

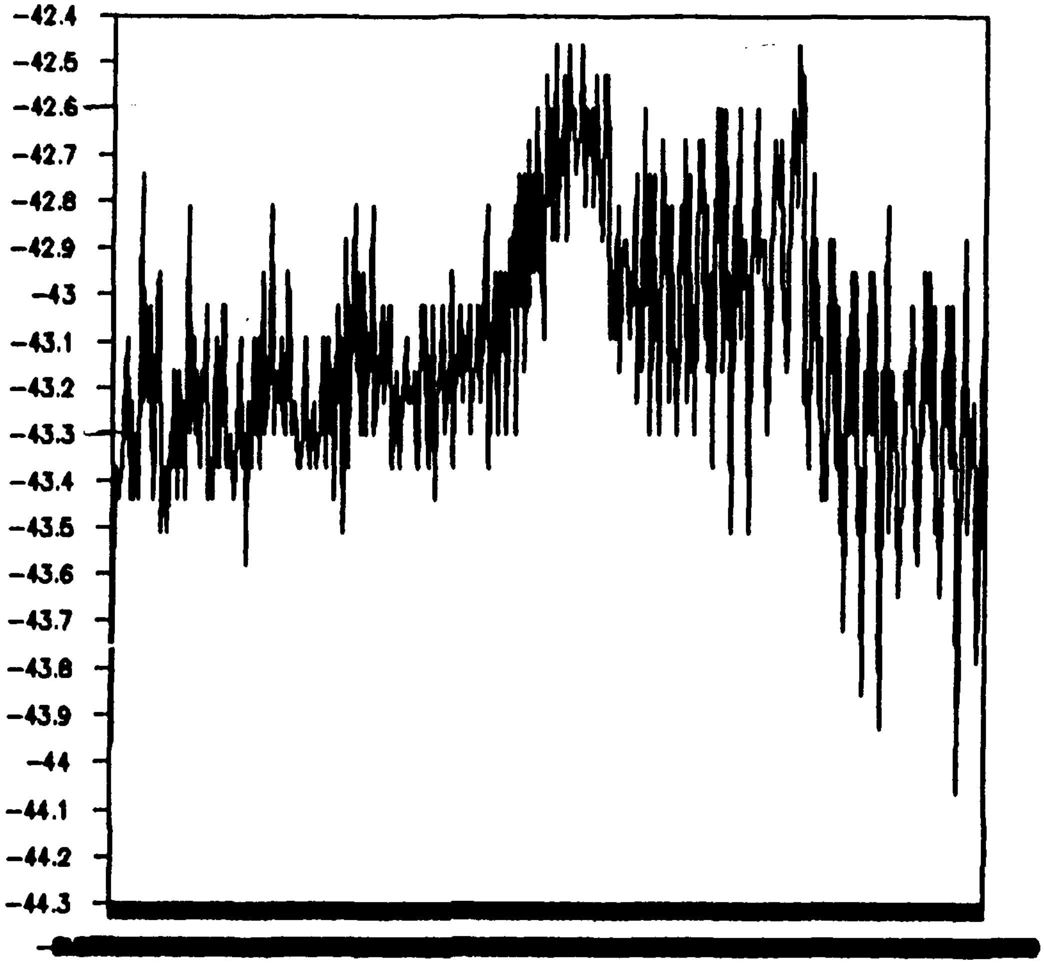
OCT9W



KTP – Blood - 70°C

small aperture

OCT 9 X

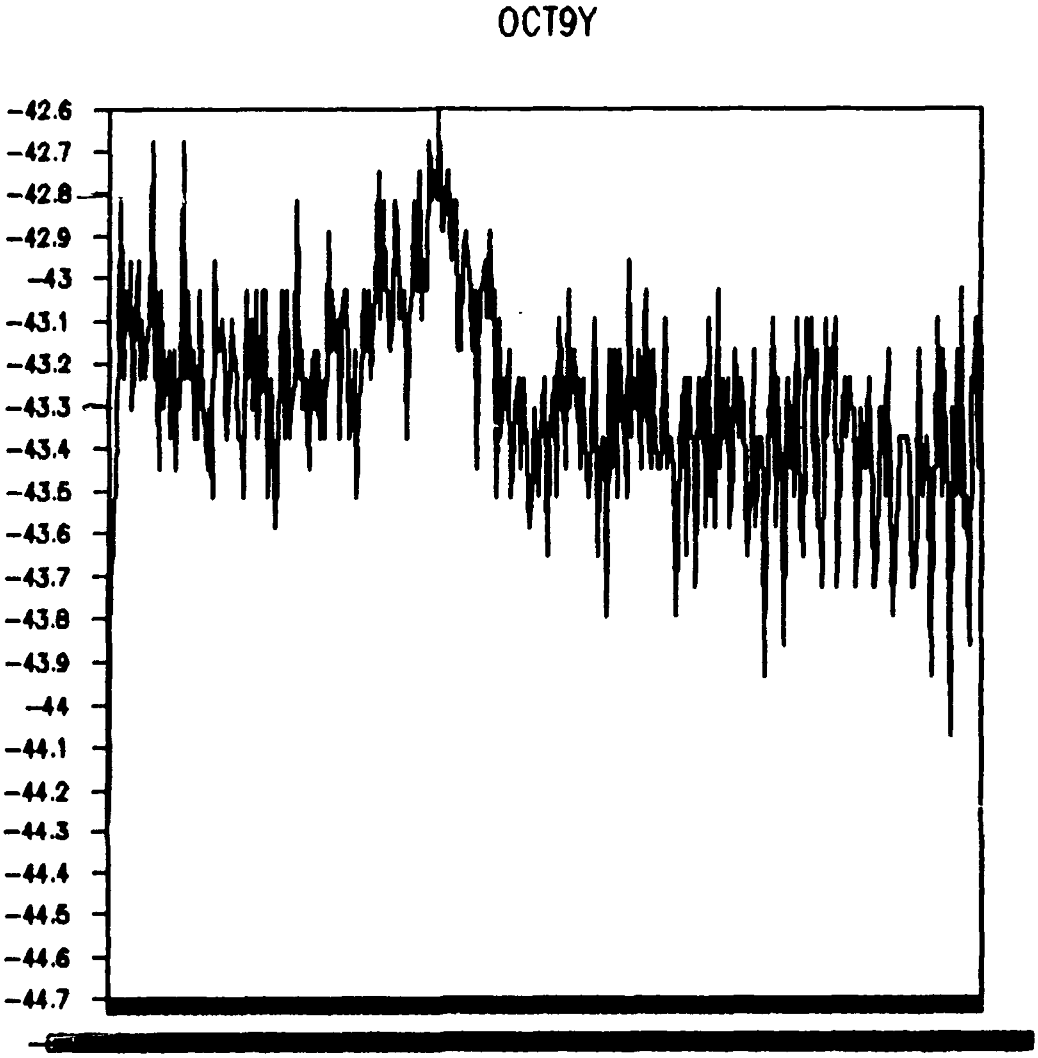


079

KTP – Blood -80°C

small aperture

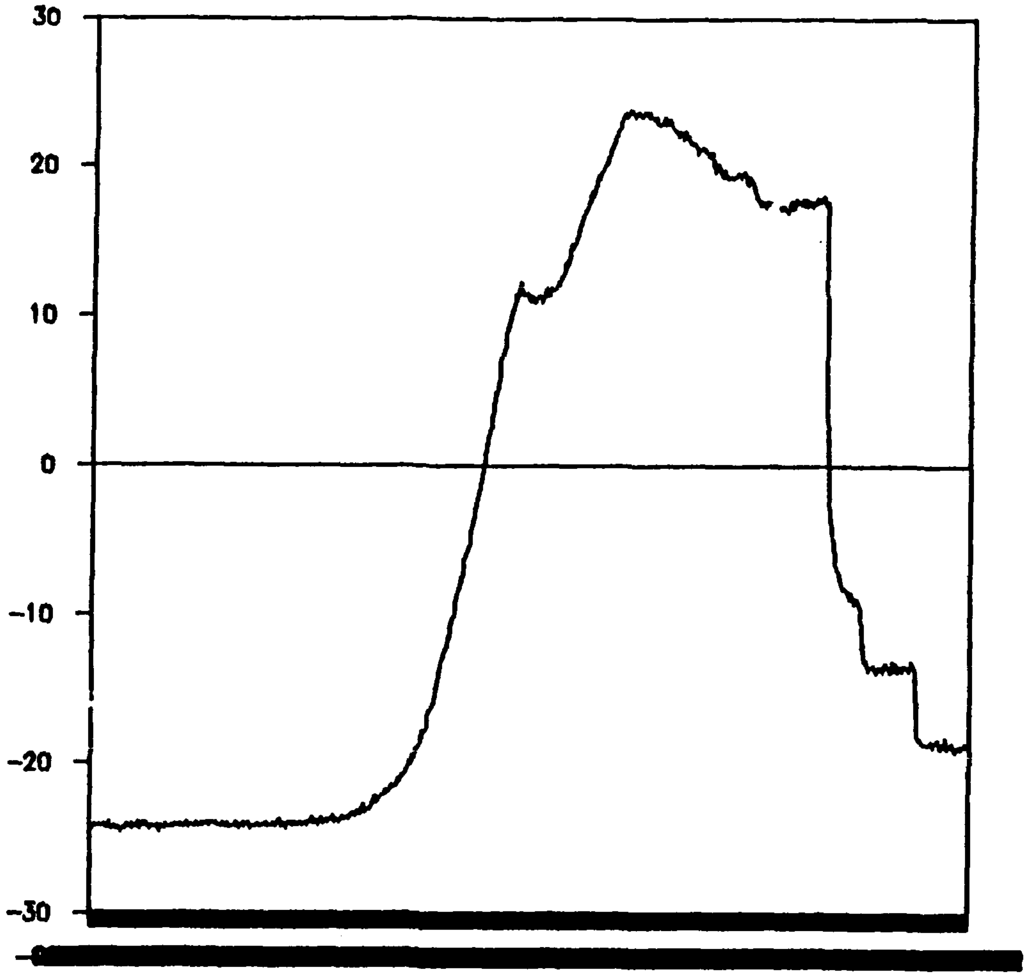
0.5 g



KTP - ~~GEF~~ Blood -100°C

small aperture

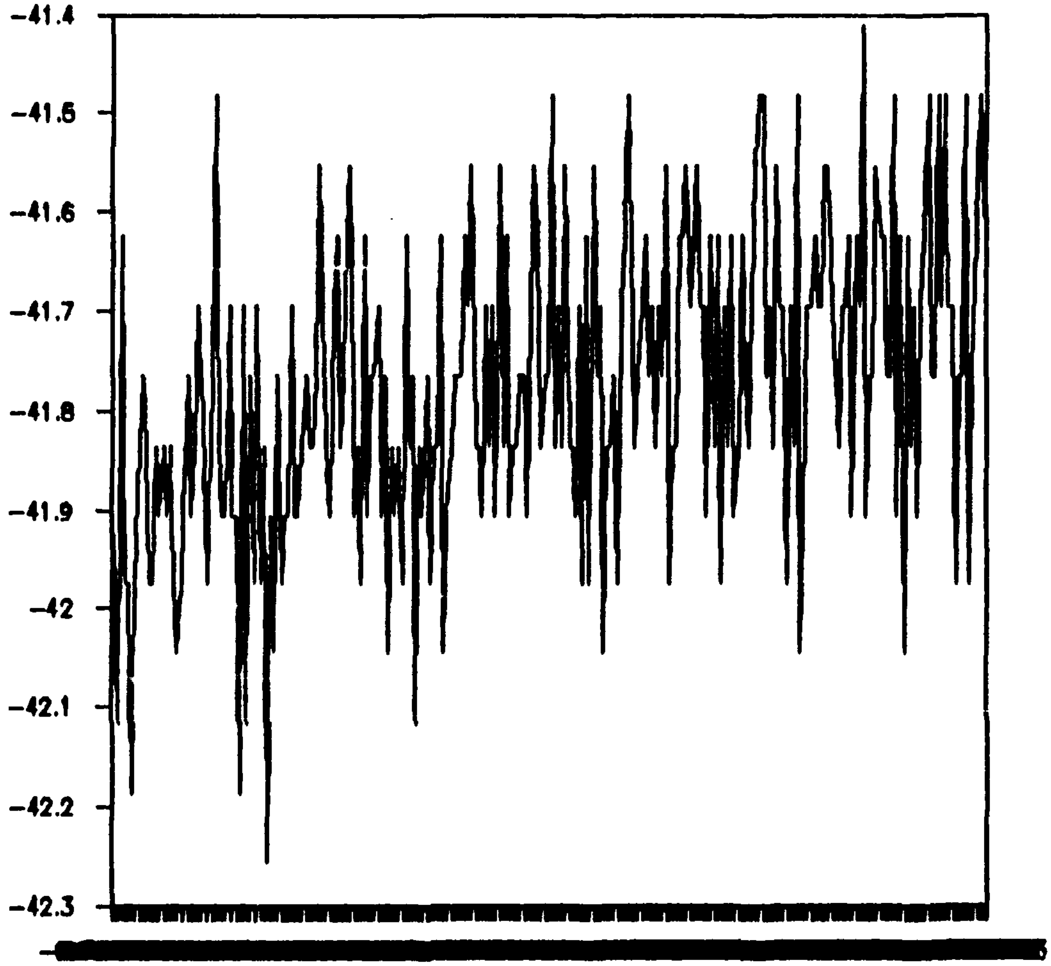
OCT10A



KTP — one strip unwelded control

small aperture

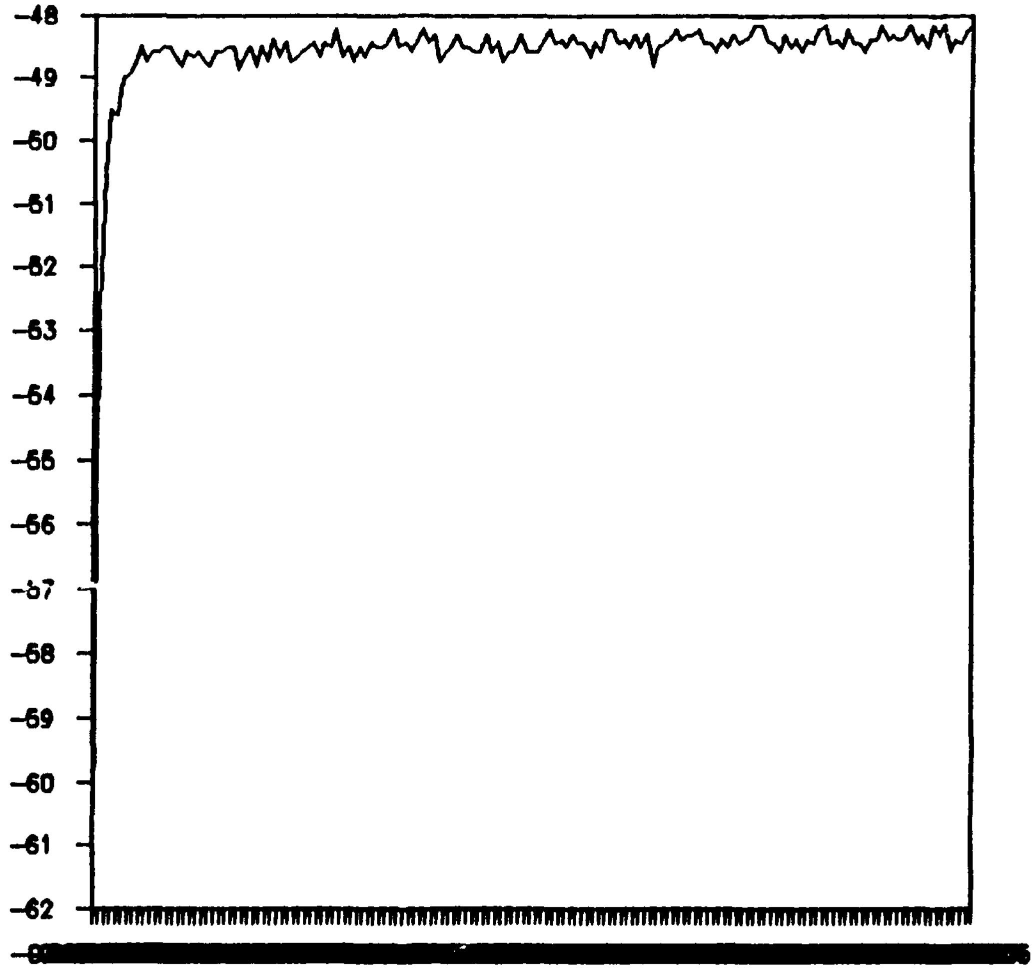
OCT10B



KTP - two strip unwelded control

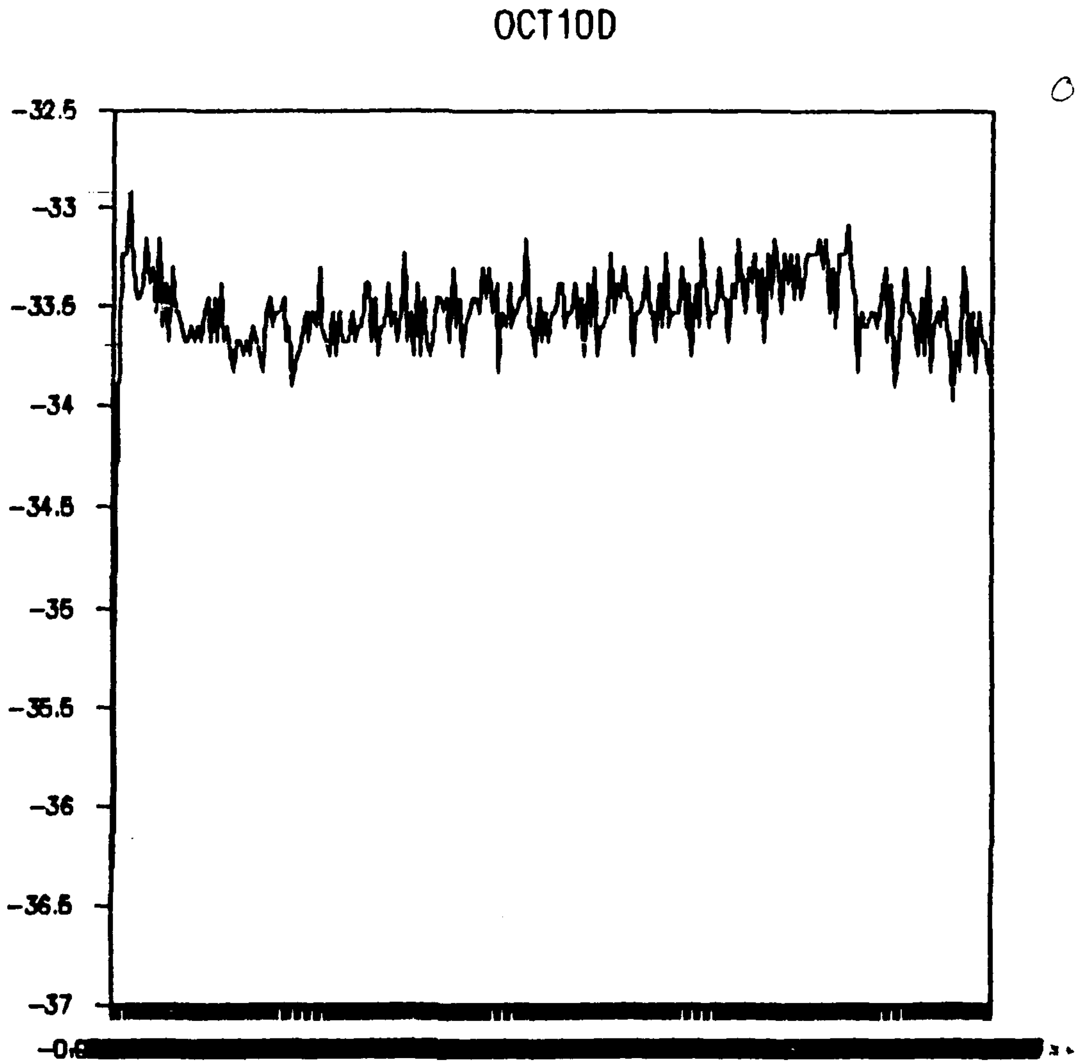
small aperture

OCT10C



KTP - 2 V ICG unwelded control

small aperture



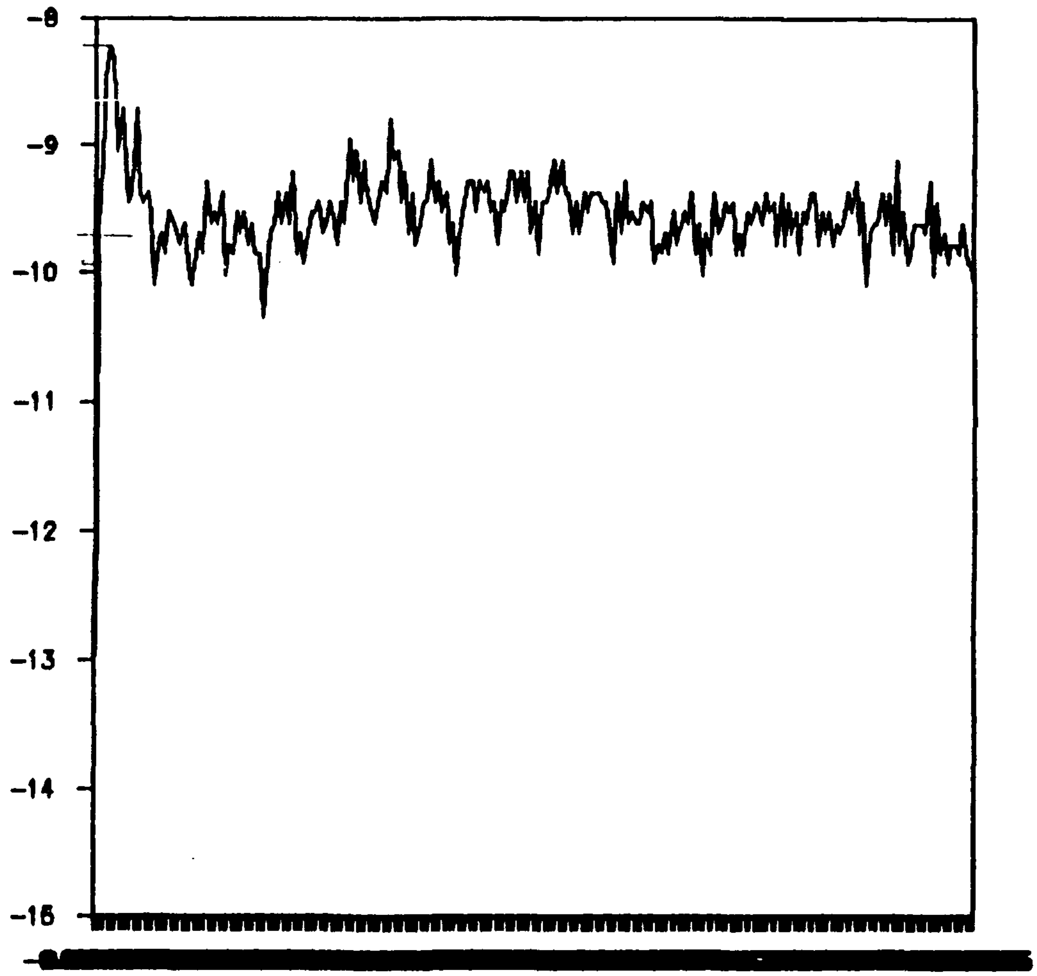
0.5g

KTP - 2x ICG - 50°C

small aperture

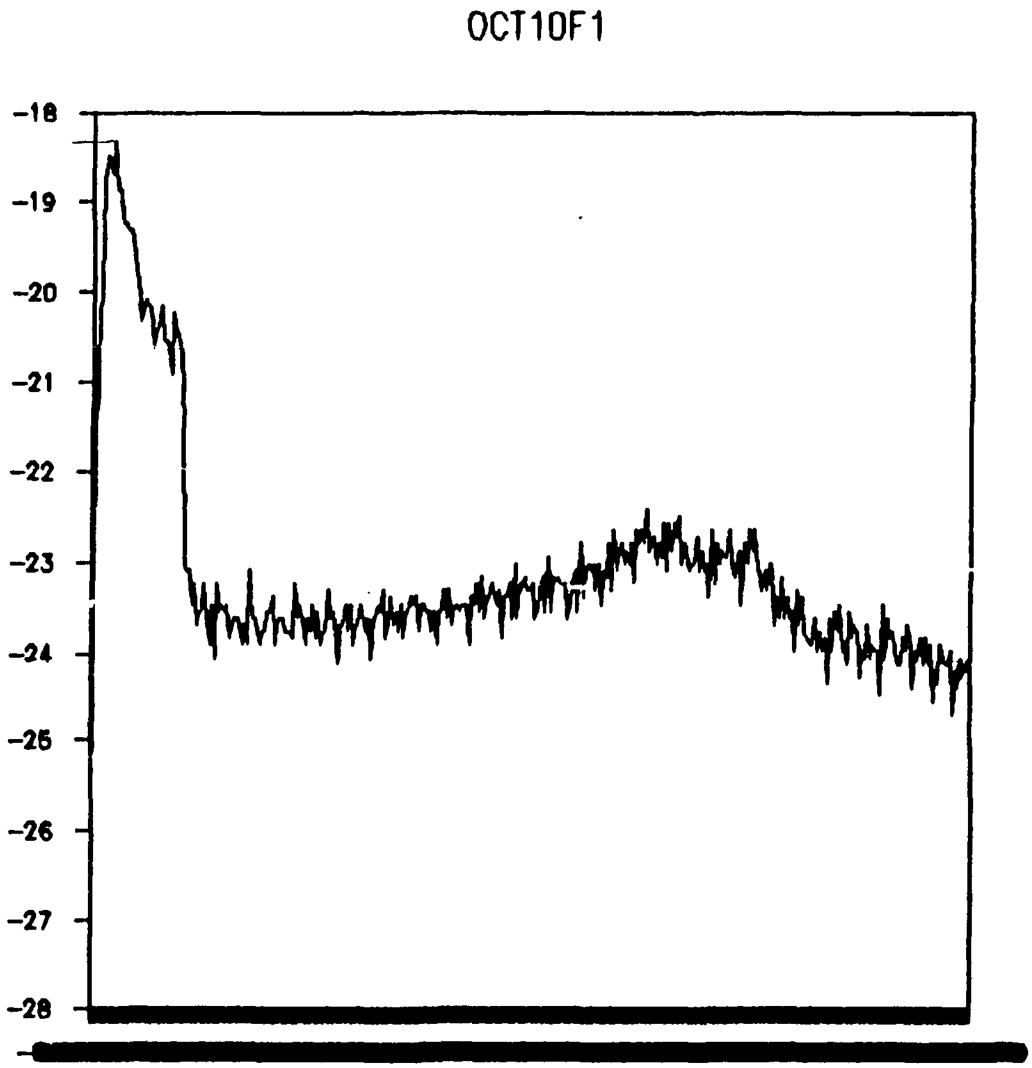
OCT10E

6.22



KTP – 2X ICG – 60°C

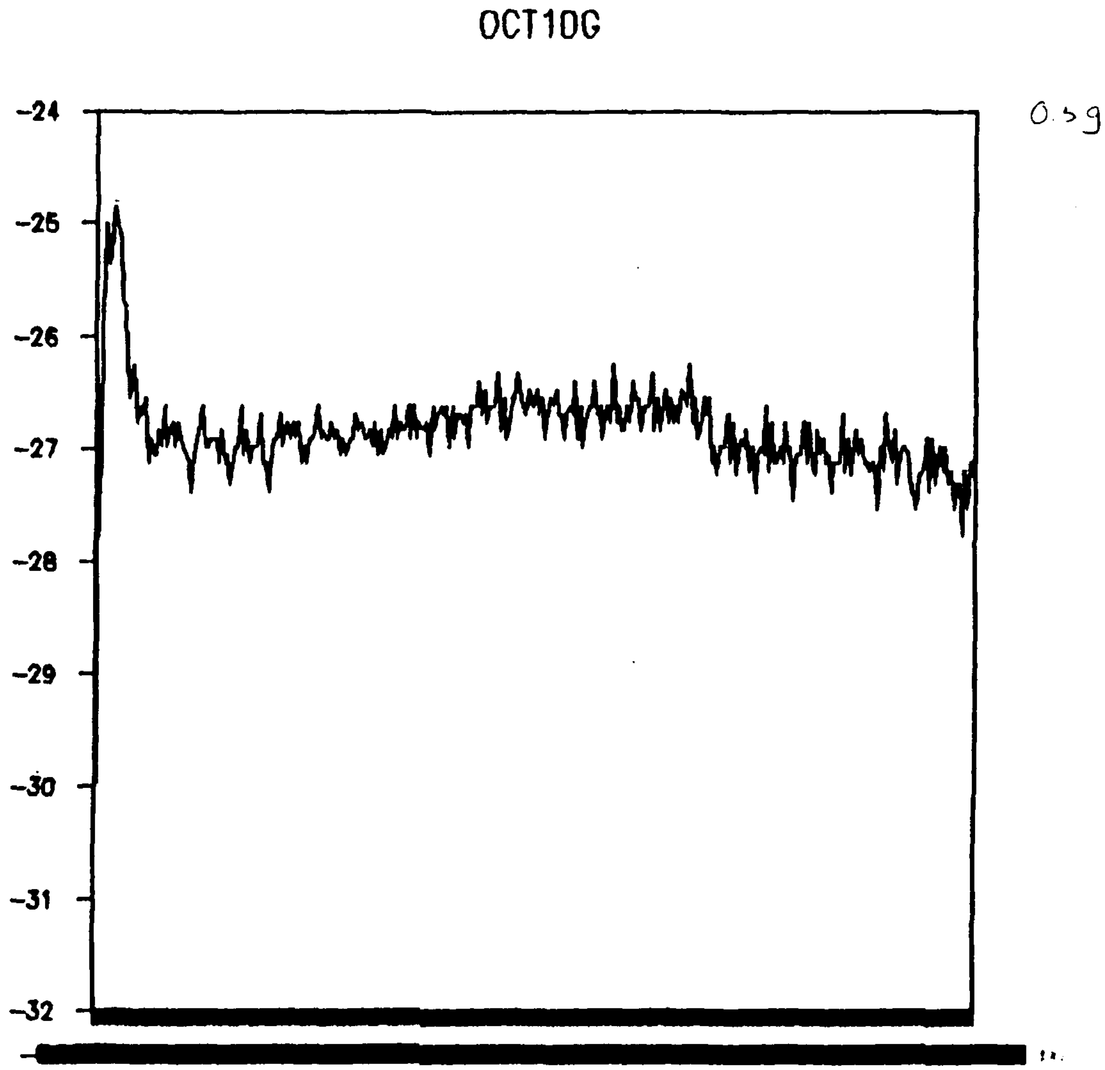
small aperture



19

KTP - 2x ICG - 70°C

small aperture

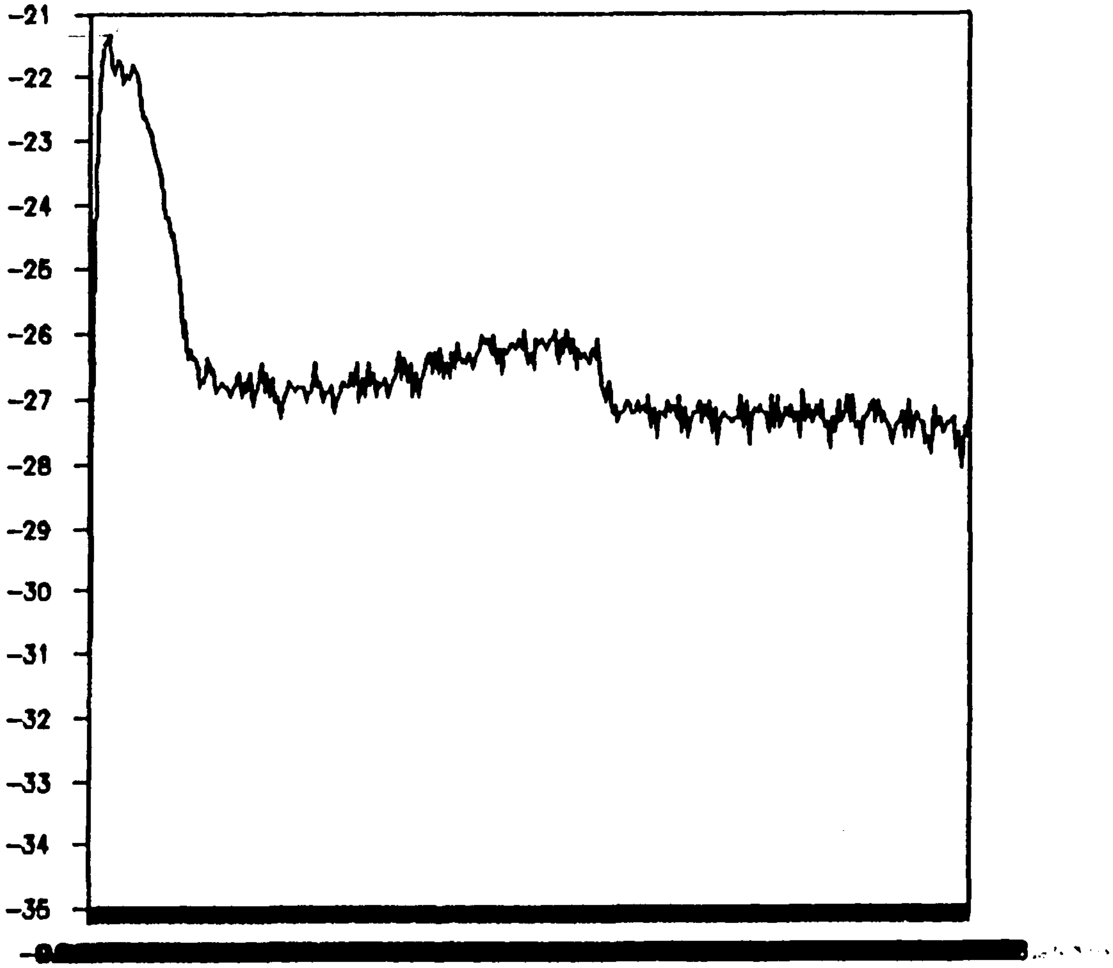


KTP - 2X 1CG - 80°C

small aperture

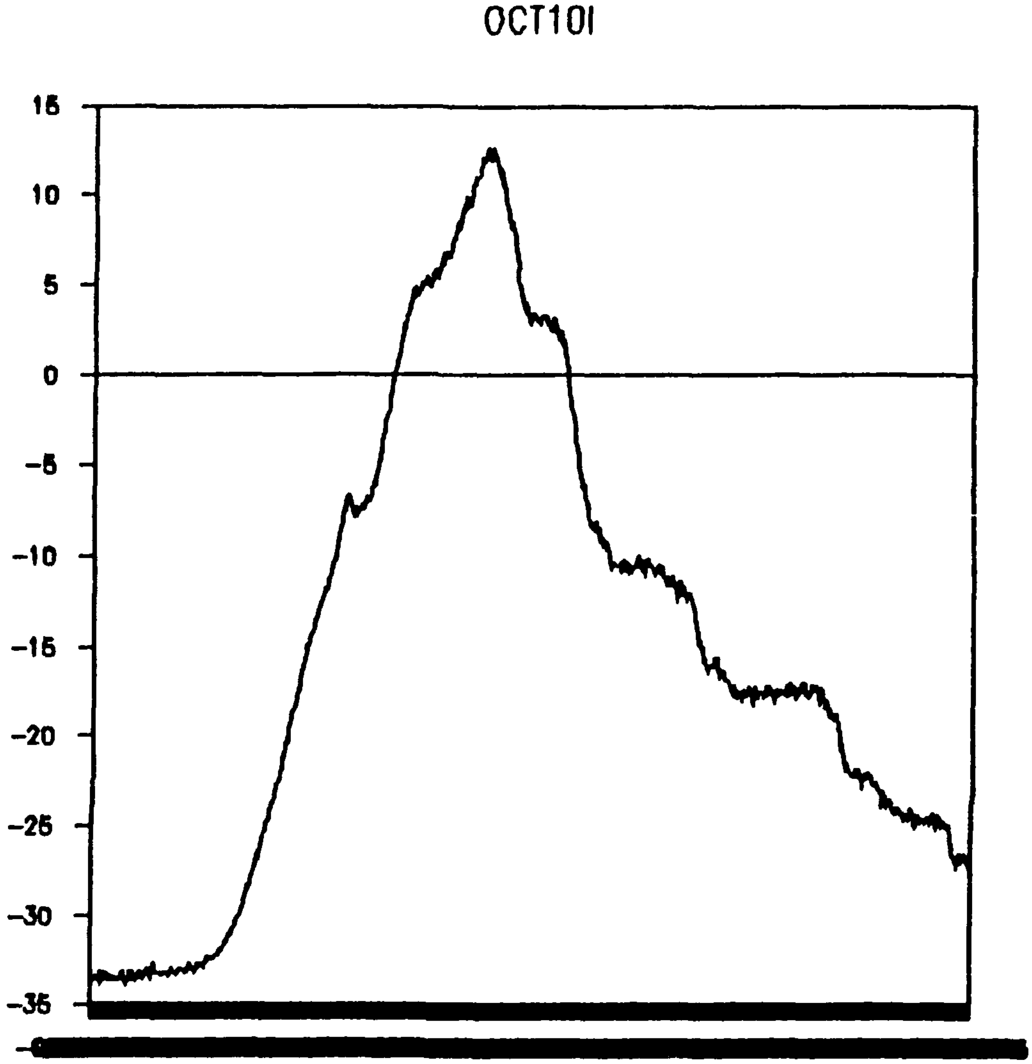
OCT10H

0.75g



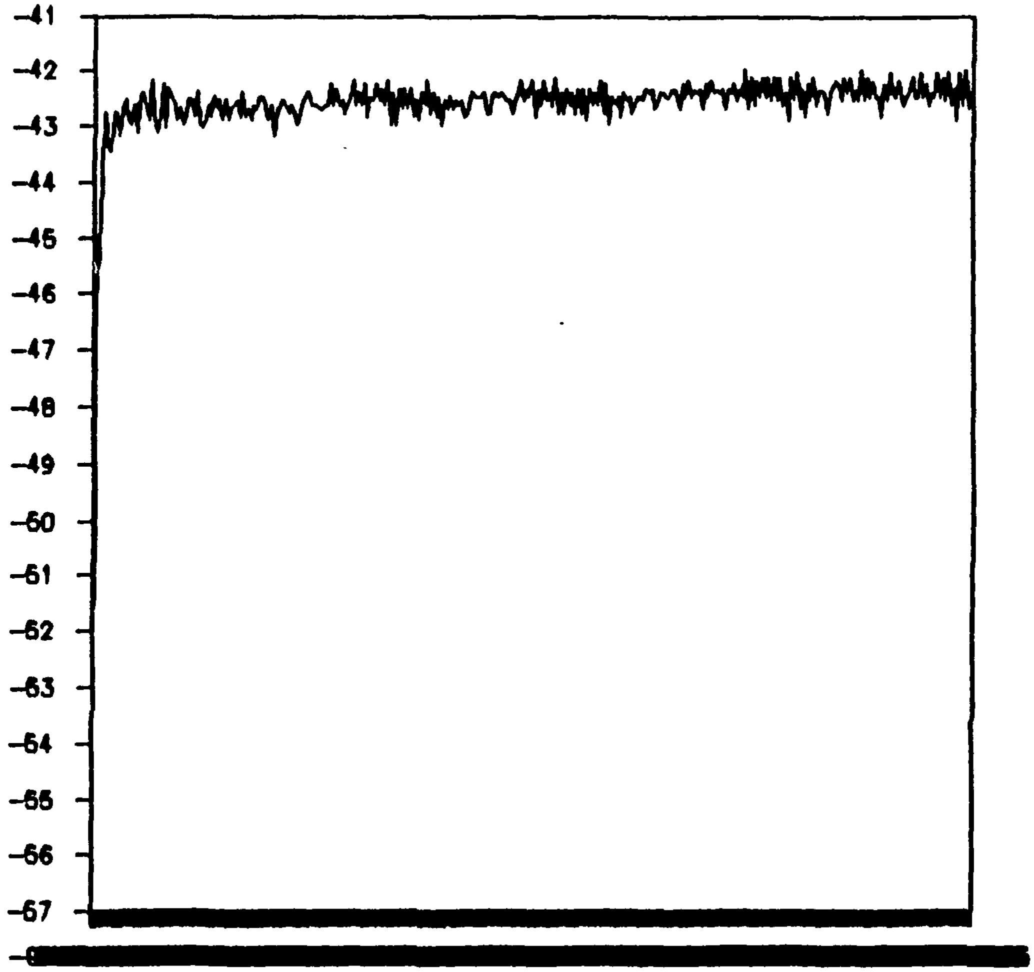
KTP - 2x ICG - 100°C

small aperture



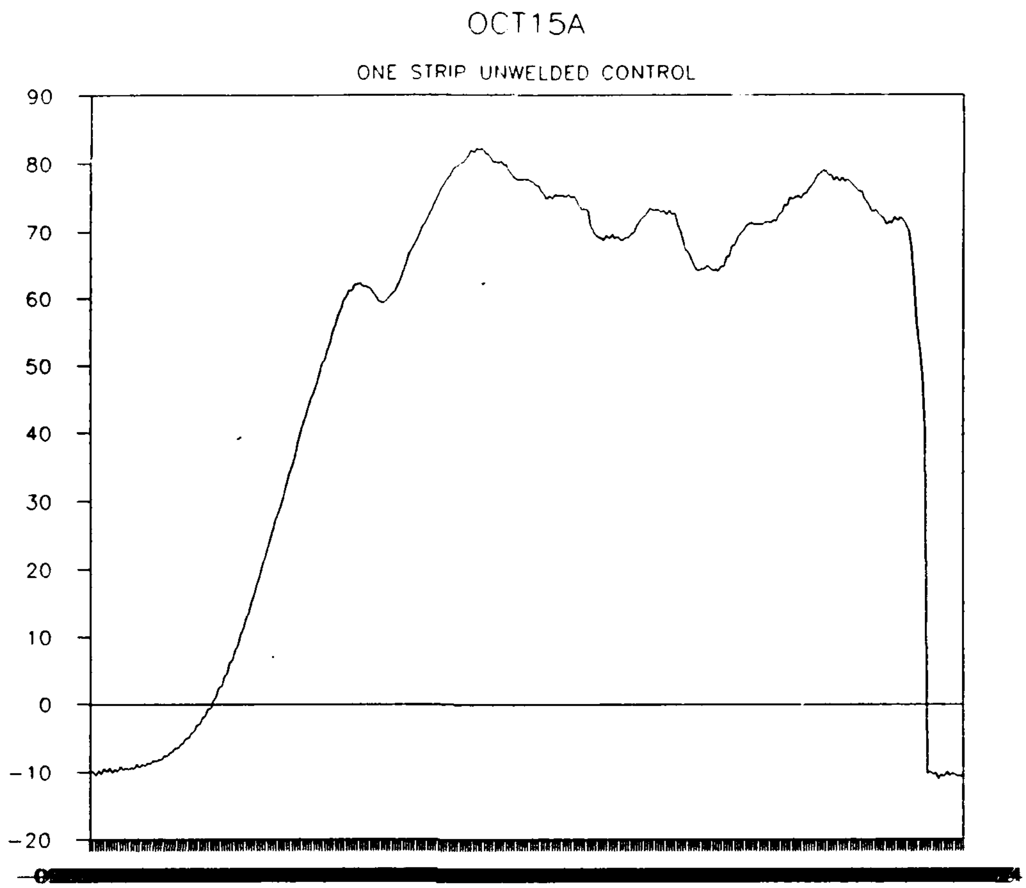
KTP - one strip unwelded control
small aperture

OCT10J



KTP - two strip unwelded control

small aperture



All trials for OCT 15, 1990

Ar^{++} Laser

Settings: Current Control

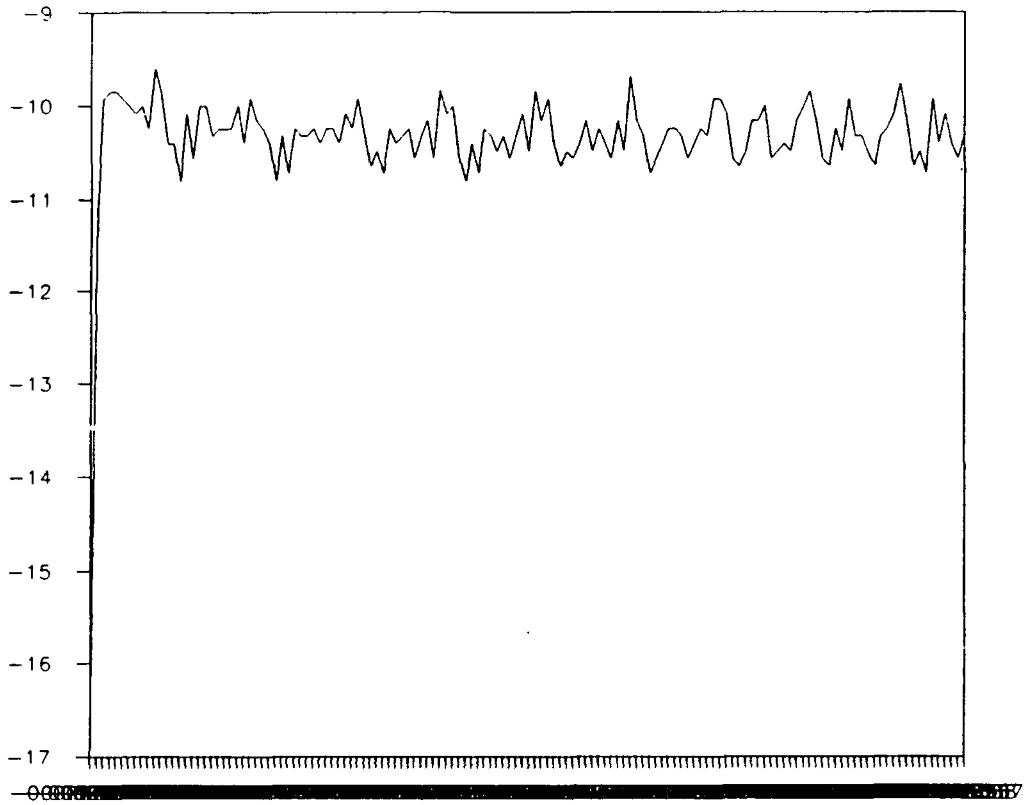
38A, 5.8W

0.7W delivered

Small Aperture

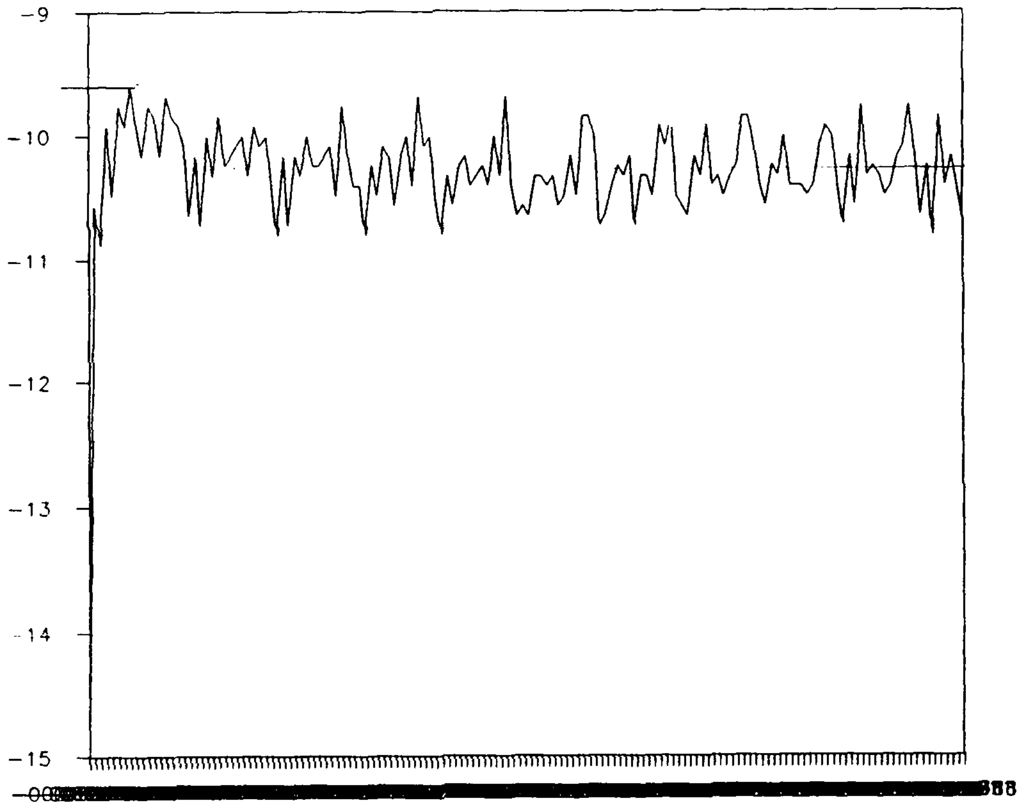
OCT15B

TWO STRIP UNWELDED CONTROL

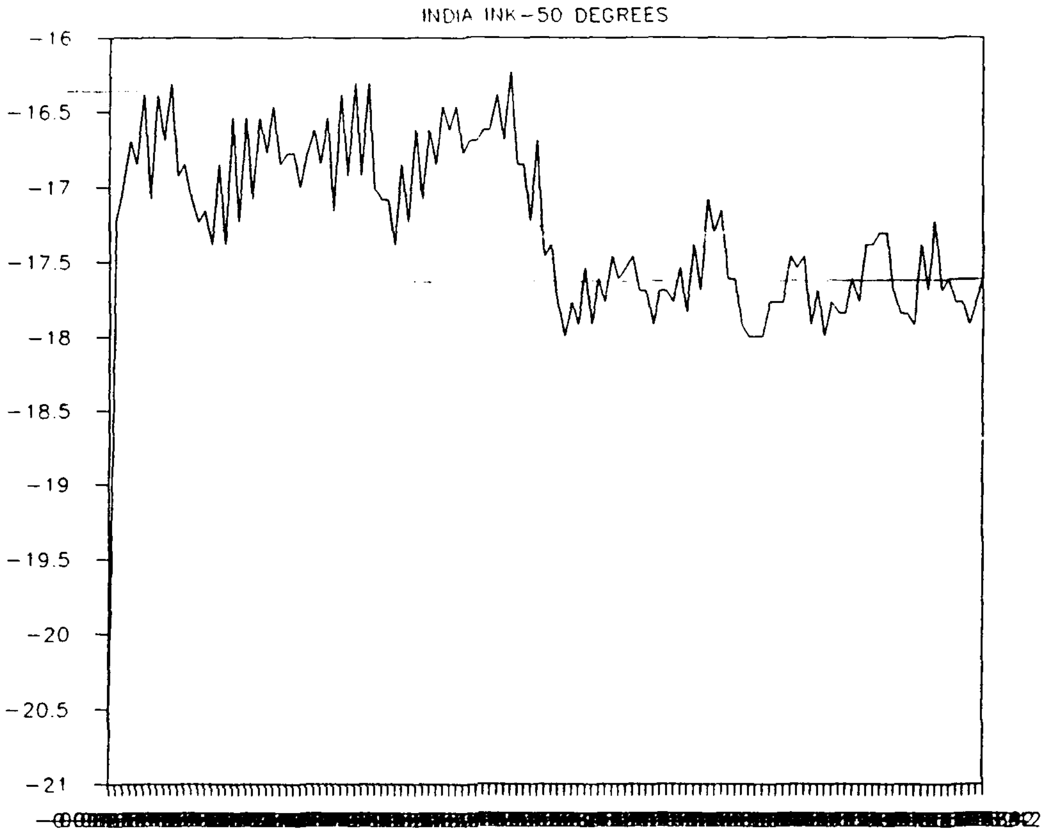


OCT15C

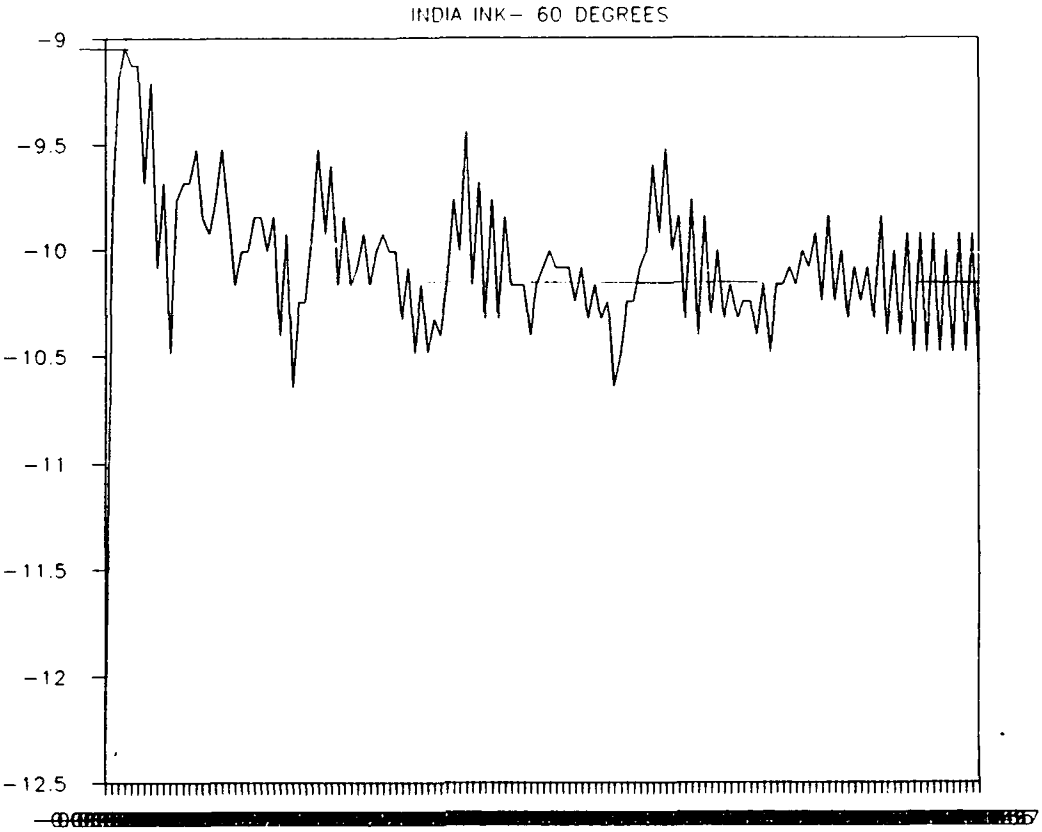
TWO STRIP INDIA INK UNWELDED



OCT15D

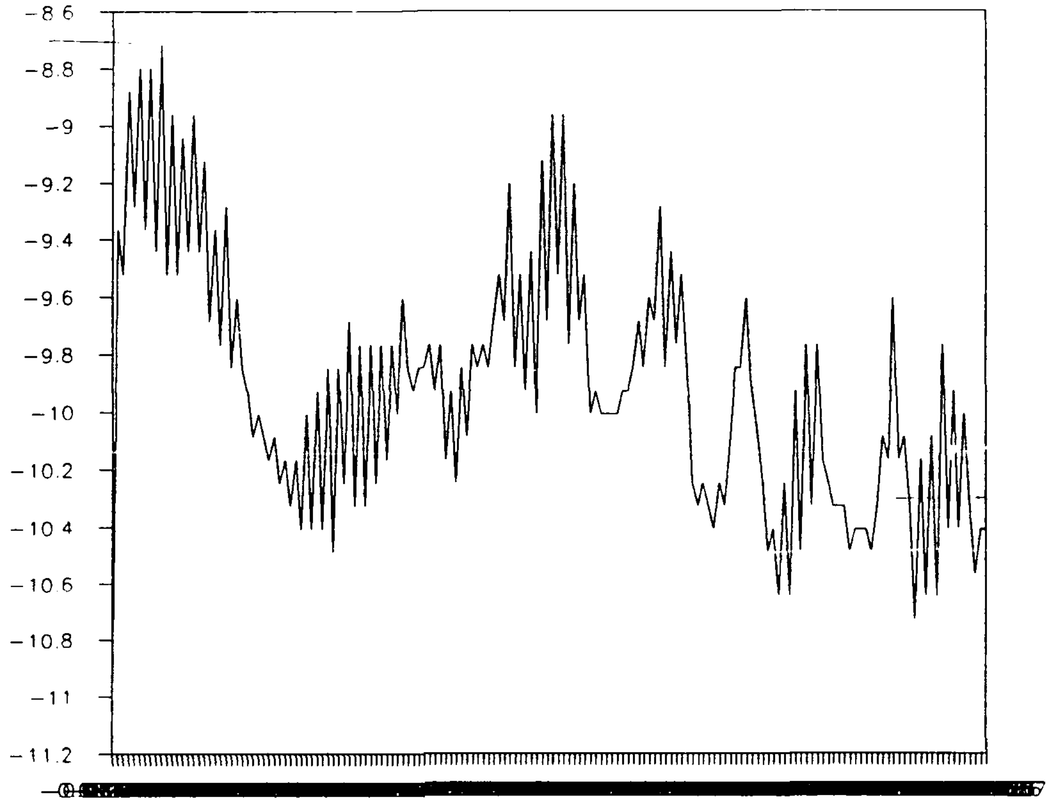


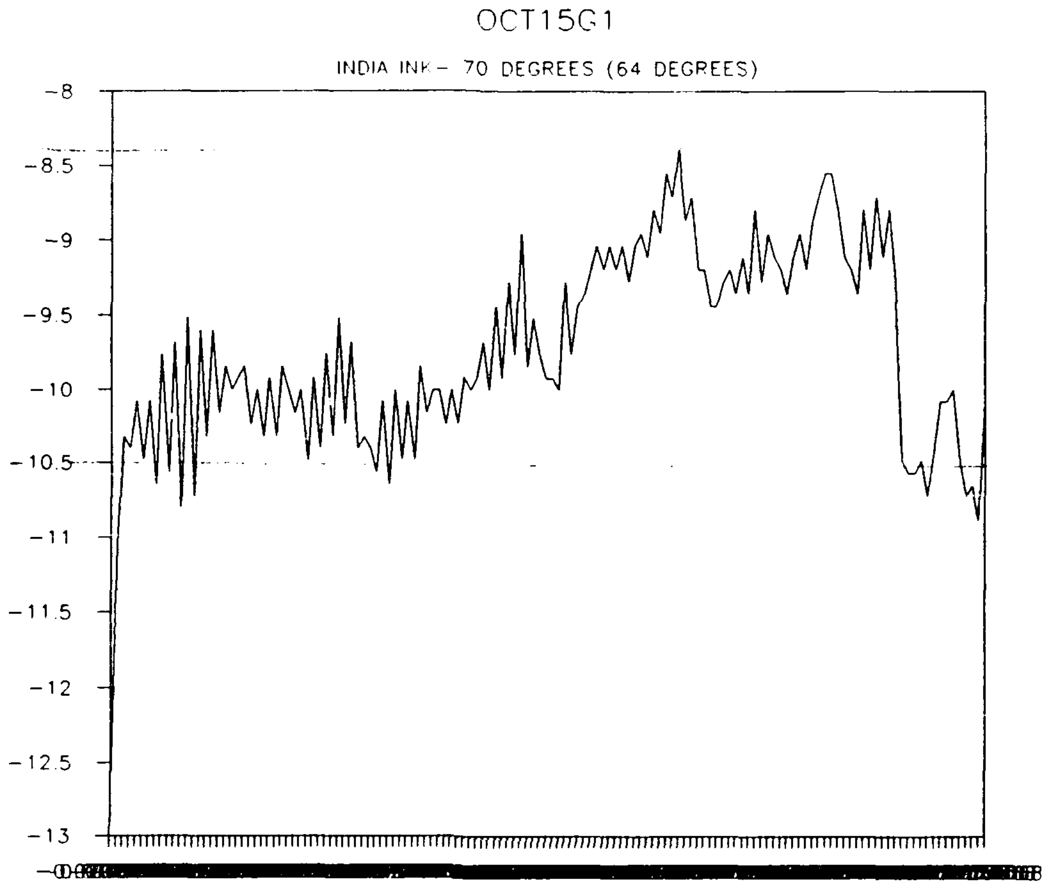
OCT15E



OCT15F1

INDIA INK– 70 DEGREES (47 DEGREES)

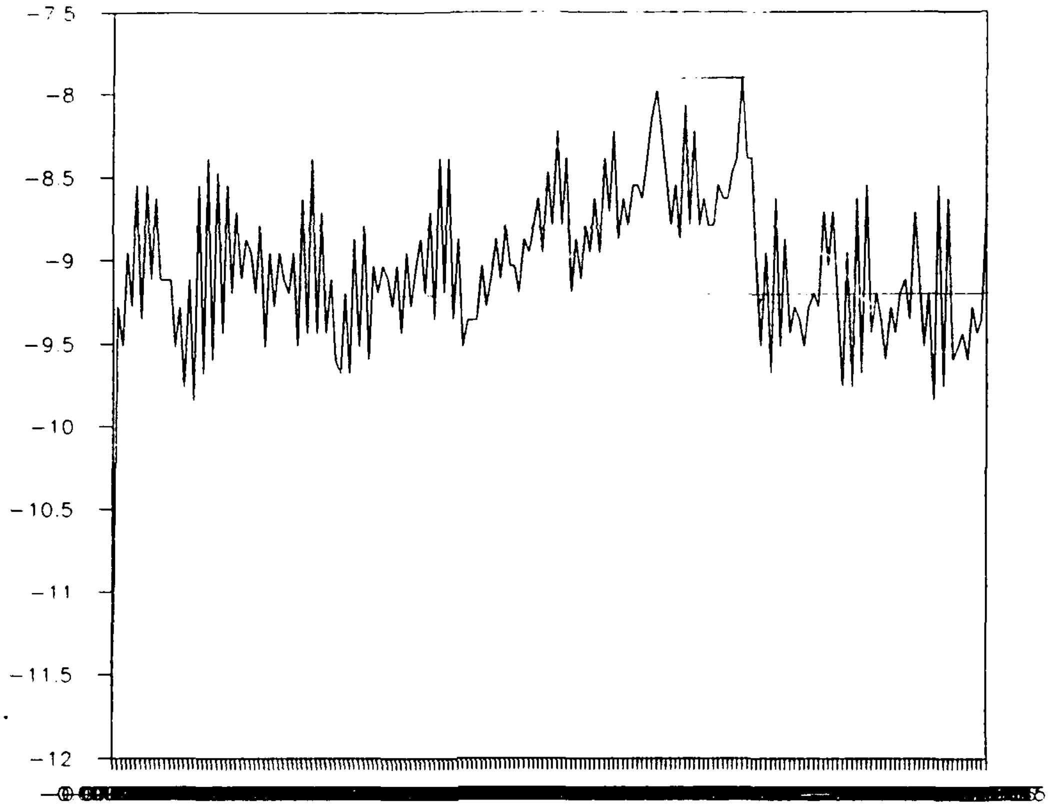


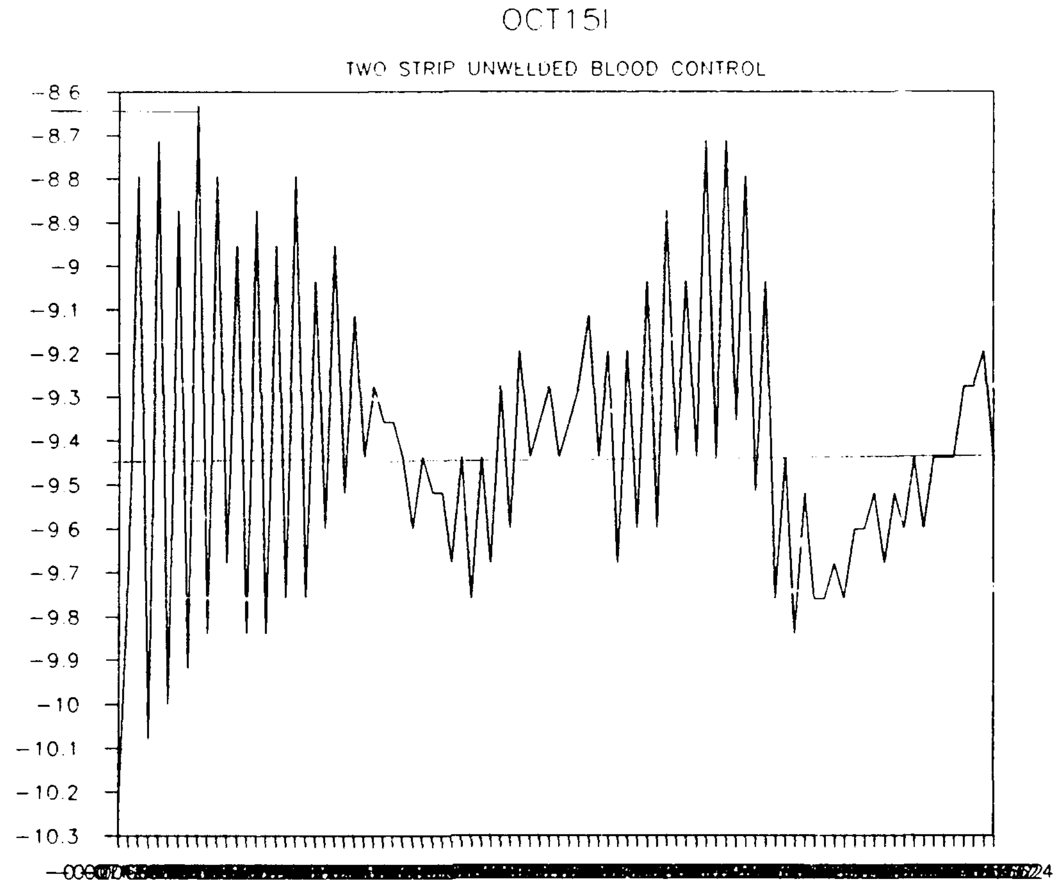


OCT15G1
INDIA INK – 70 DEGREES (64 DEGREES)
-8
-8.5
-9
-9.5
-10
-10.5
-11
-11.5
-12
-12.5
-13

OCT15H1

INDIA INK- 80 DEGREES (66 DEGREES)

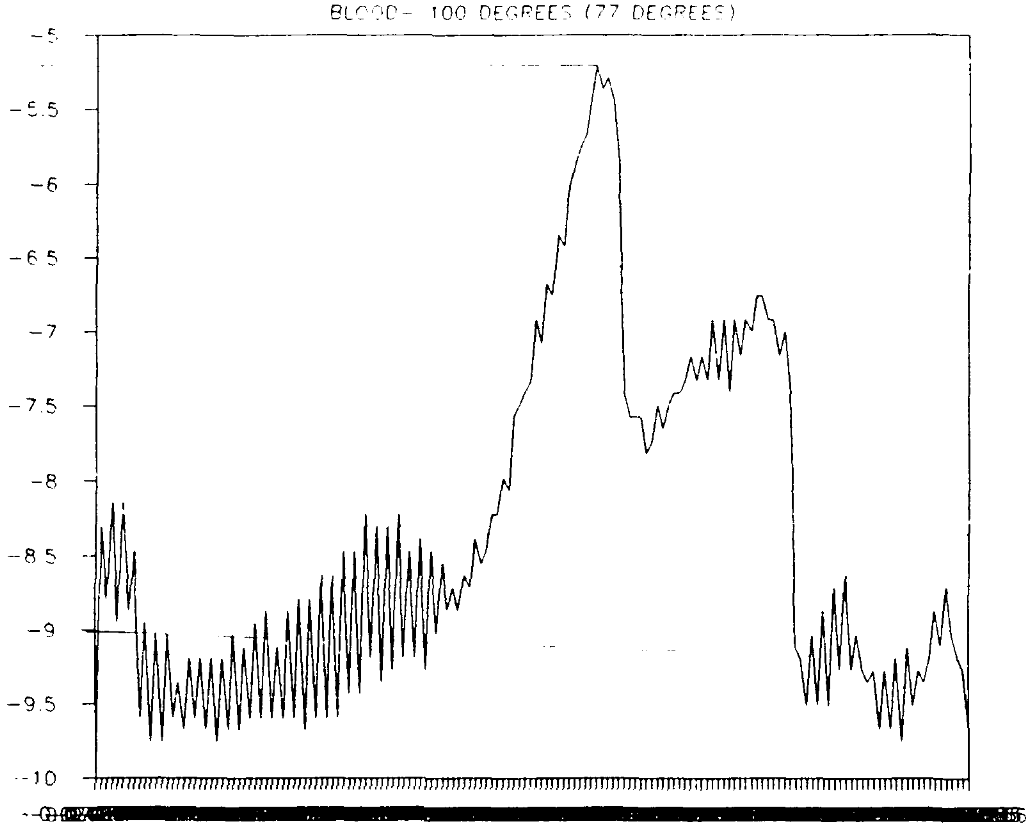




OCT15I
TWO STRIP UNWELDED BLOOD CONTROL
-8.6
-8.7
-8.8
-8.9
-9
-9.1
-9.2
-9.3
-9.4
-9.5
-9.6
-9.7
-9.8
-9.9
-10
-10.1
-10.2
-10.3

409

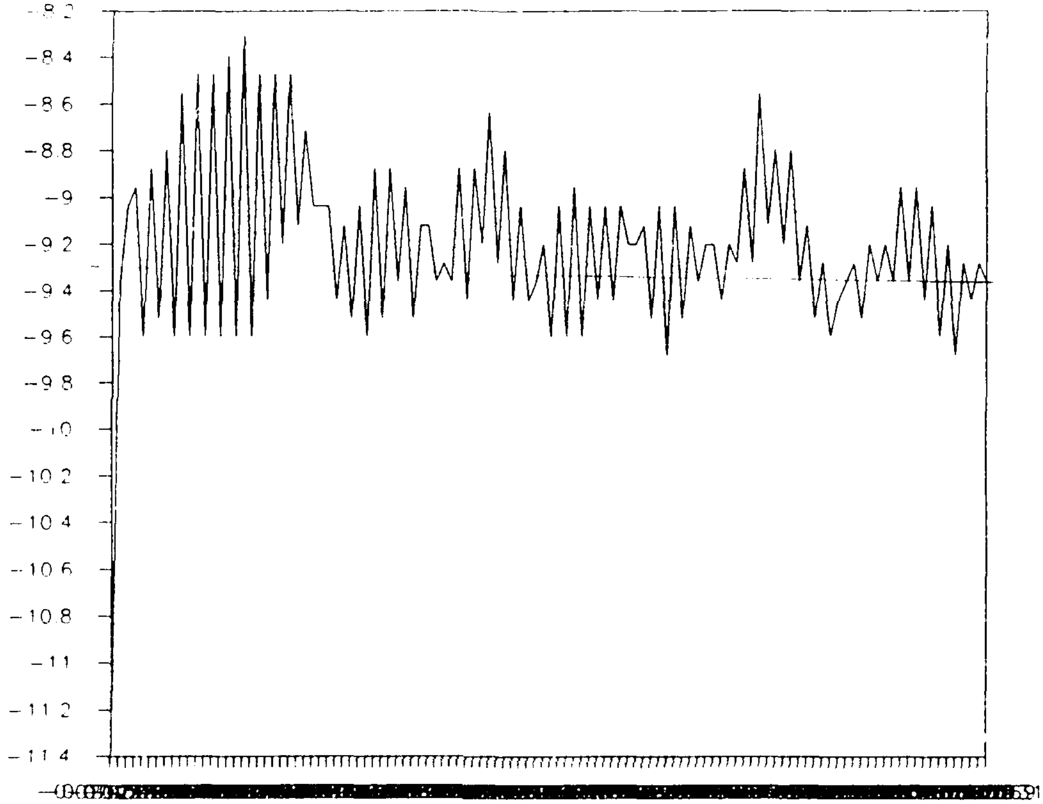
OCT15J1



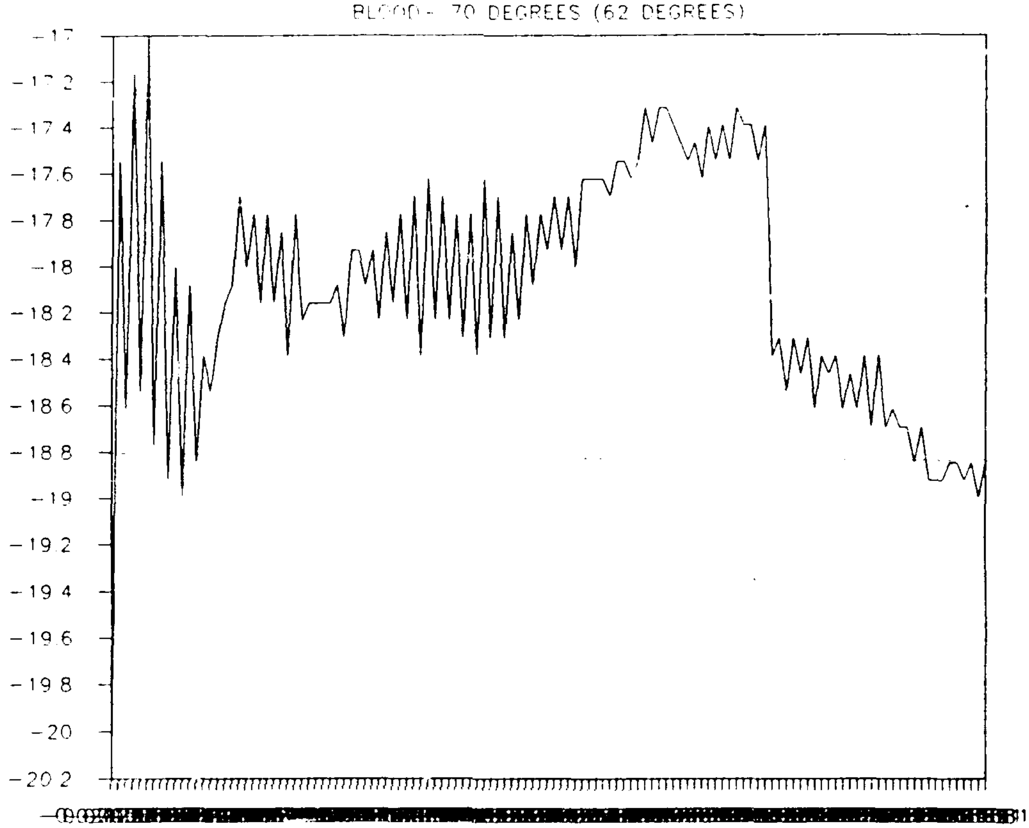
OCT15F1

5.29

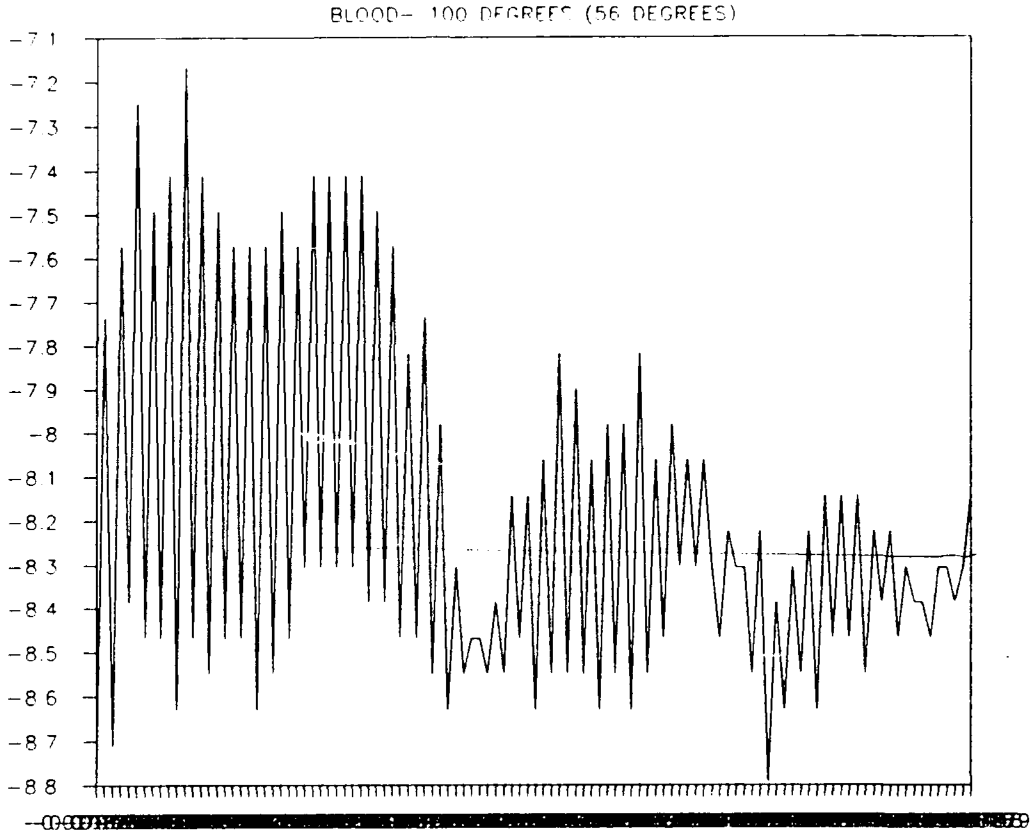
BLOOD 50 DEGREES (44 DEGREES)

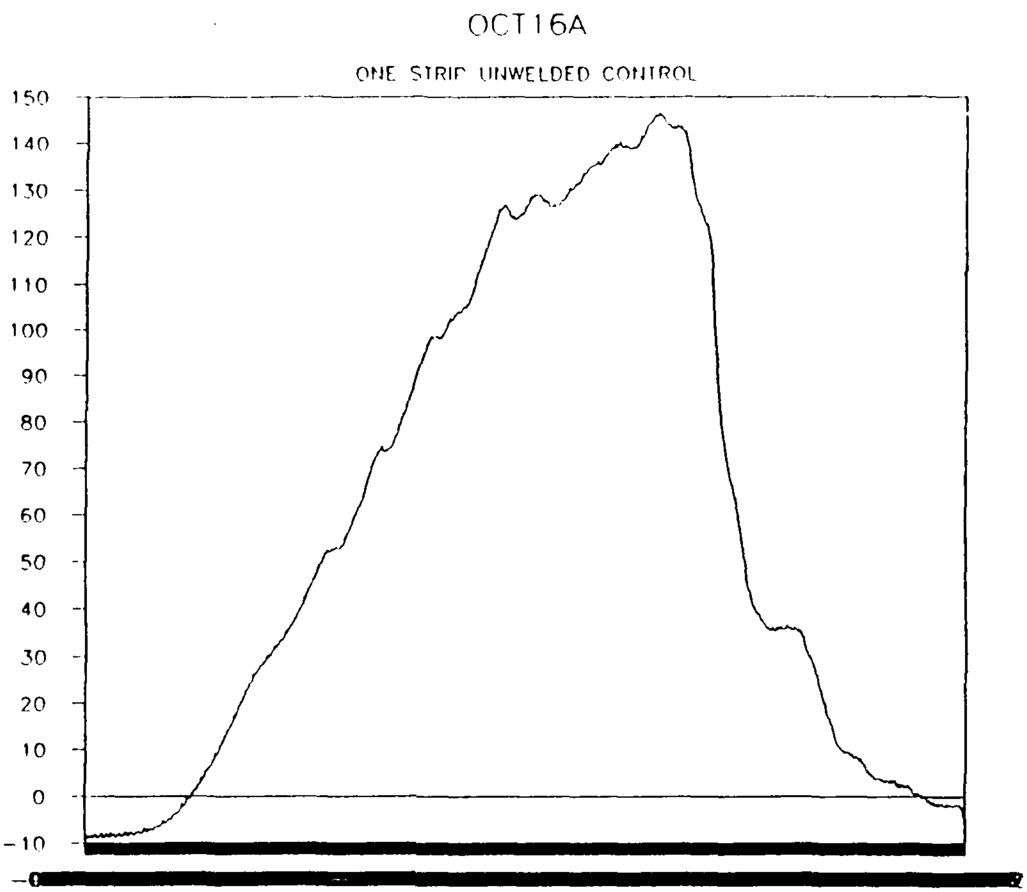


OCT15M1


BLOOD - 70 DEGREES (62 DEGREES)
-17
-17.2
-17.4
-17.6
-17.8
-18
-18.2
-18.4
-18.6
-18.8
-19
-19.2
-19.4
-19.6
-19.8
-20
-20.2

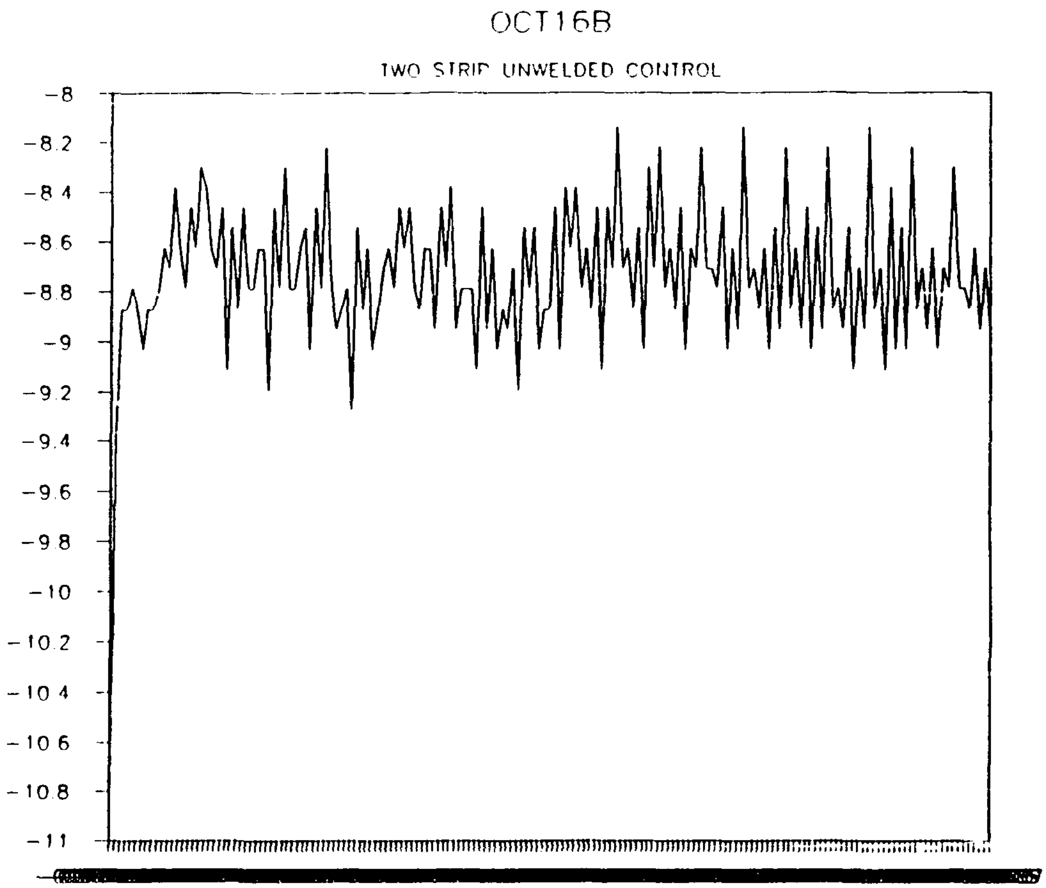
OCT15P1

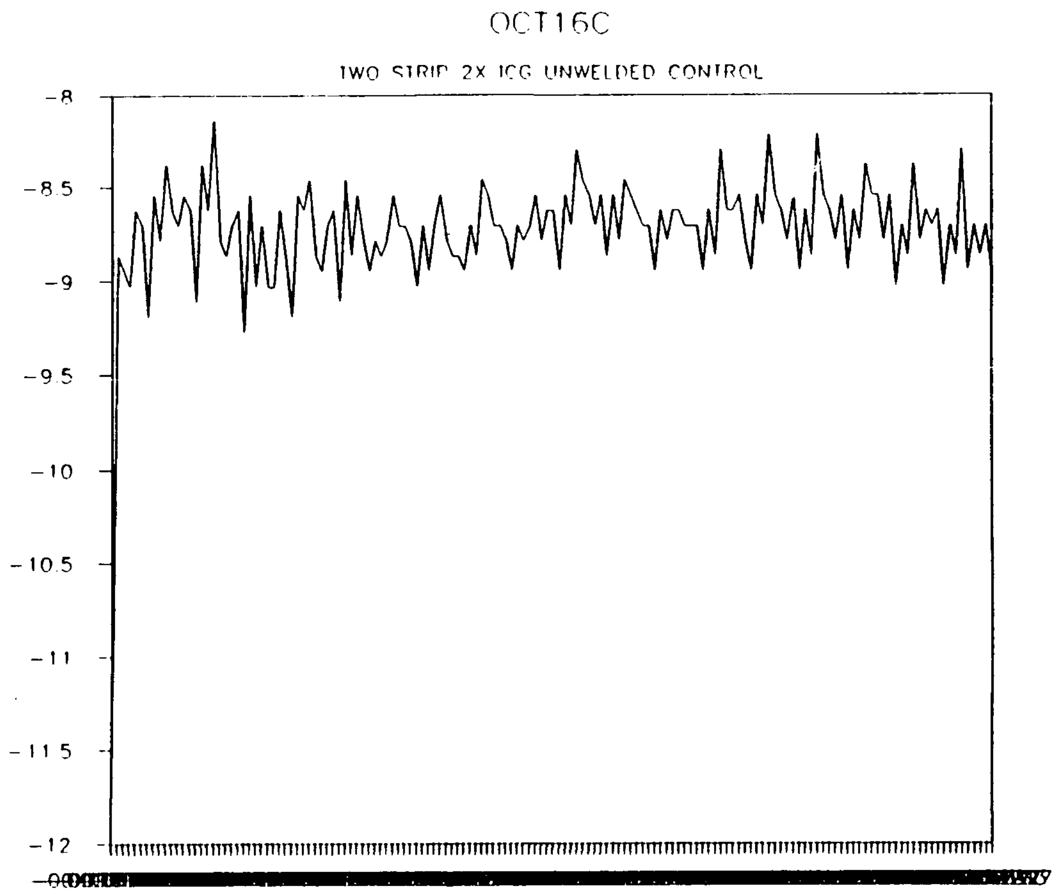

BLOOD- 100 DEGREES (56 DEGREES)
-7.1
-7.2
-7.3
-7.4
-7.5
-7.6
-7.7
-7.8
-7.9
-8
-8.1
-8.2
-8.3
-8.4
-8.5
-8.6
-8.7
-8.8



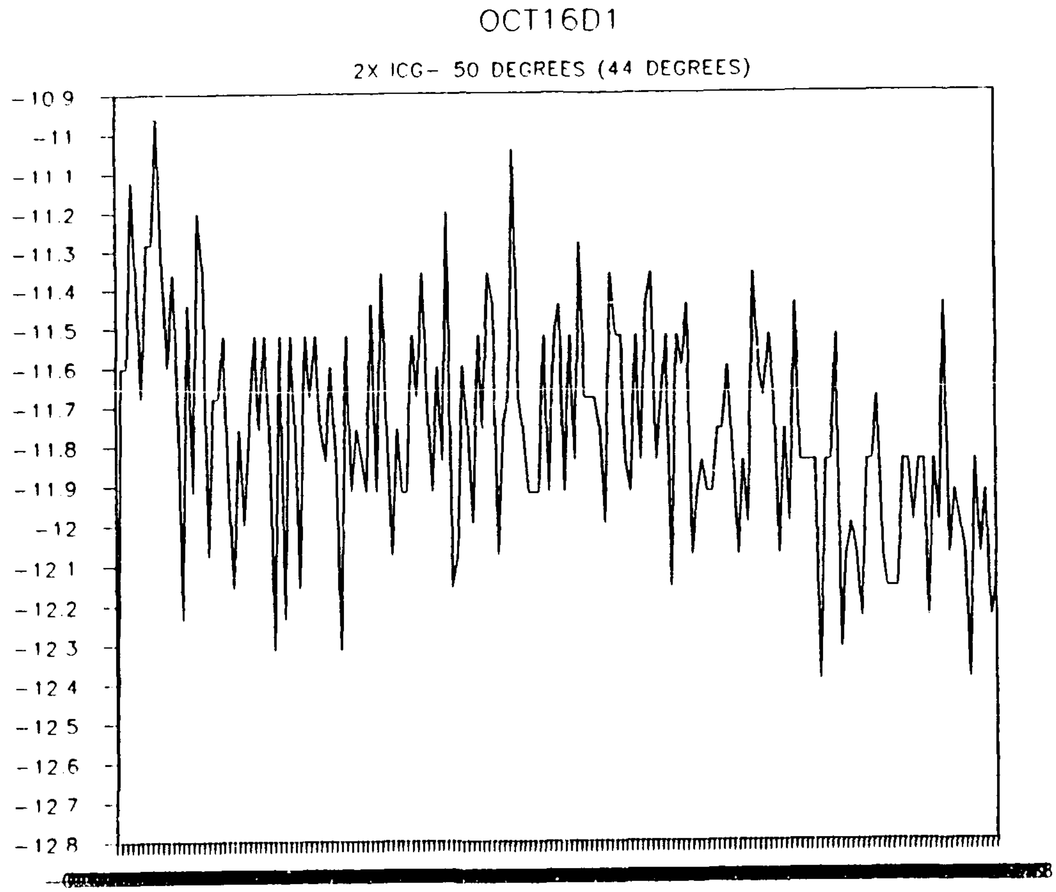
All trials for OCT 16, 1990
Ar^{++} Laser
Settings: Current Control
38A, 5.8W

0.8W delivered
Small Aperture


OCT16B
TWO STRIP UNWELDED CONTROL
-8
-8.2
-8.4
-8.6
-8.8
-9
-9.2
-9.4
-9.6
-9.8
-10
-10.2
-10.4
-10.6
-10.8
-11

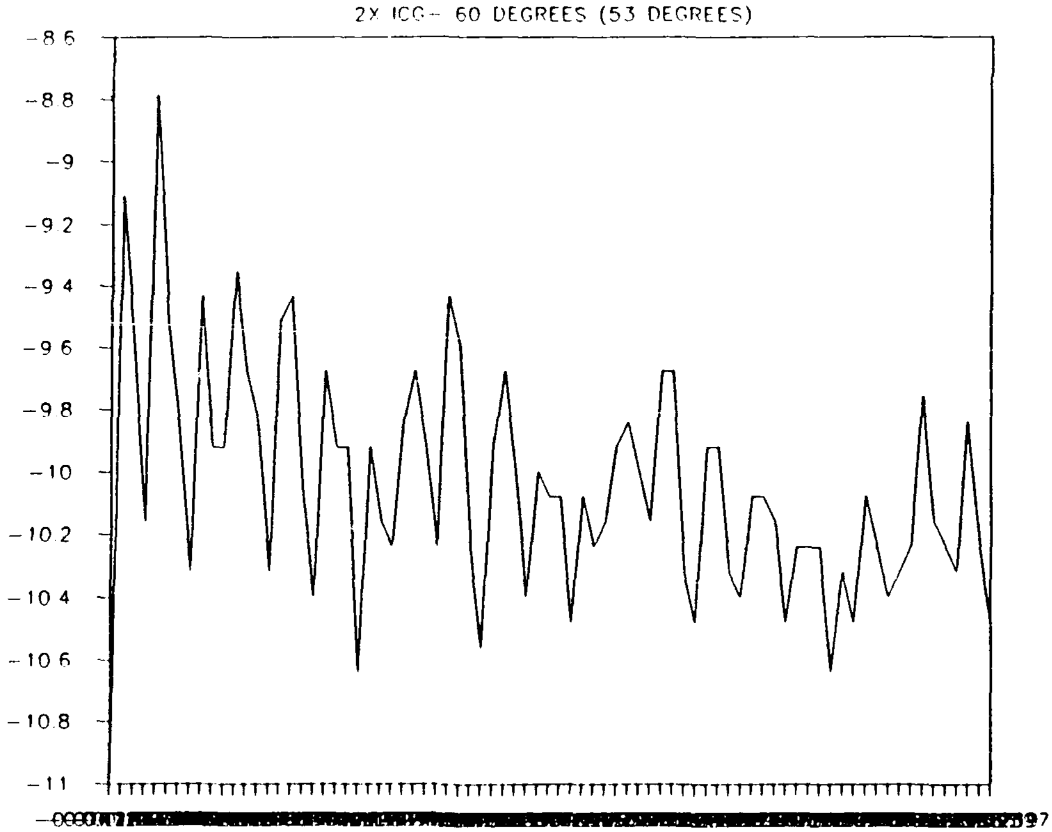

OCT16C
TWO STRIP 2X ICG UNWELDED CONTROL
-8
-8.5
-9
-9.5
-10
-10.5
-11
-11.5
-12

0.37



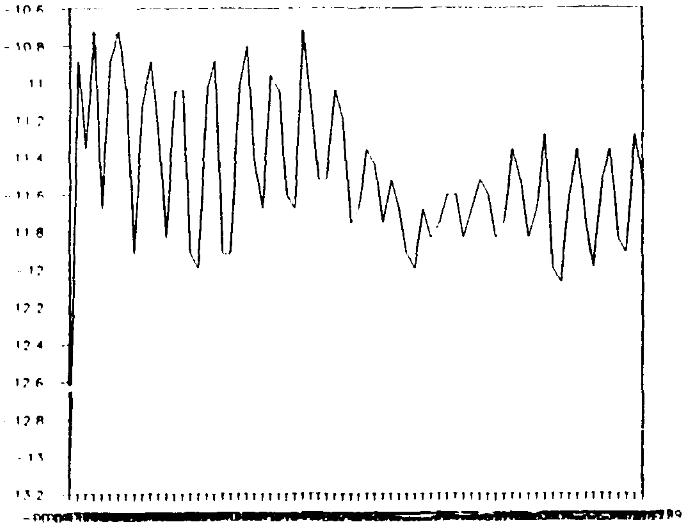
OCT16D1
2X ICG- 50 DEGREES (44 DEGREES)
-10.9
-11
-11.1
-11.2
-11.3
-11.4
-11.5
-11.6
-11.7
-11.8
-11.9
-12
-12.1
-12.2
-12.3
-12.4
-12.5
-12.6
-12.7
-12.8

OCT16F


2X ICG– 60 DEGREES (53 DEGREES)
-8.6
-8.8
-9
-9.2
-9.4
-9.6
-9.8
-10
-10.2
-10.4
-10.6
-10.8
-11

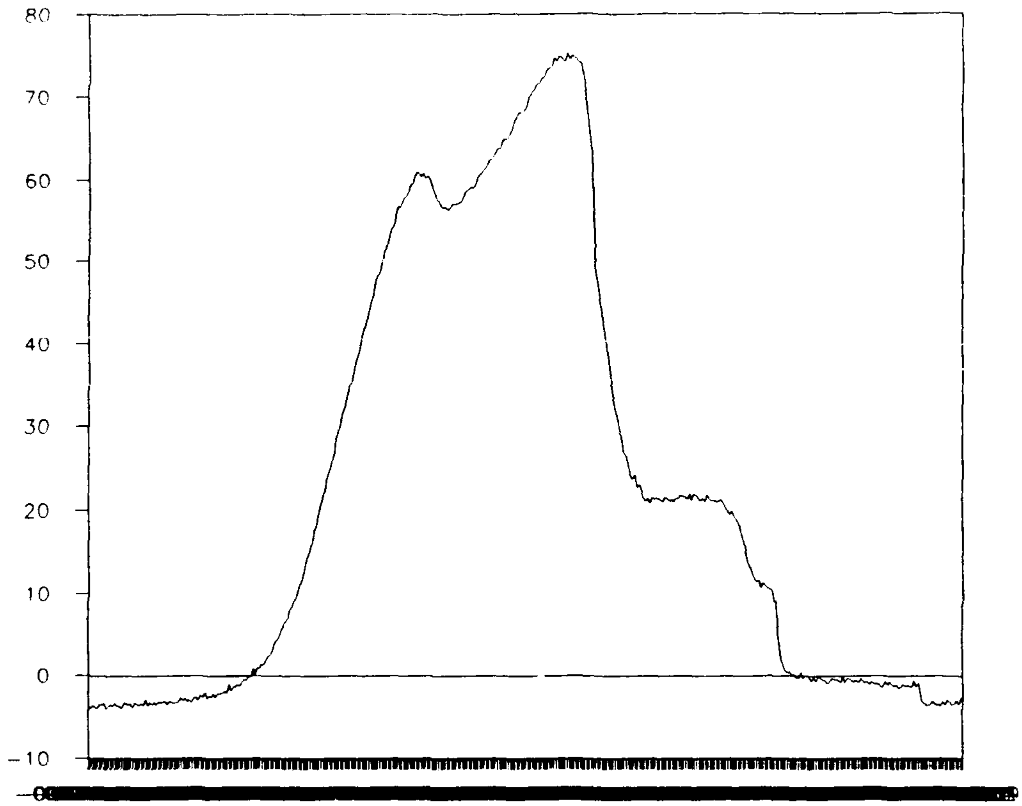
OC116H

2X ICG- 70 DEGREES (46 DEGREES)



OCT19A

ONE STRIP UNWELDED CONTROL

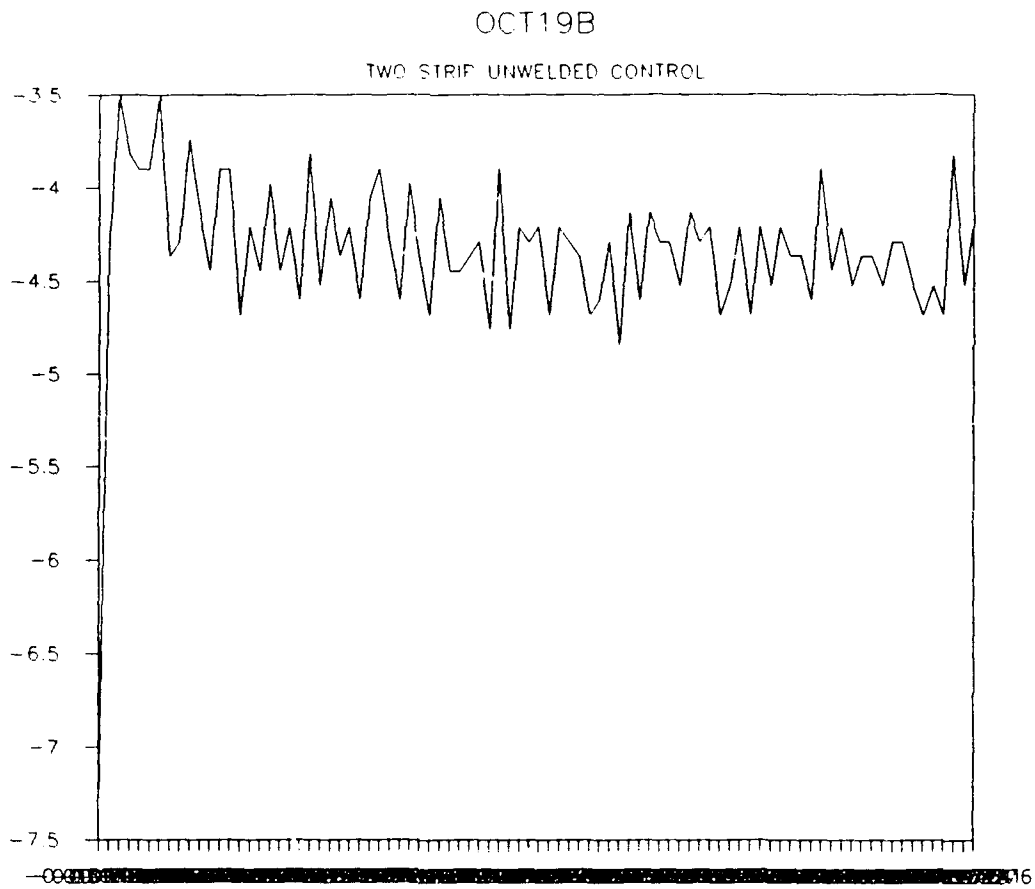


For all trials on OCT 19, 1990

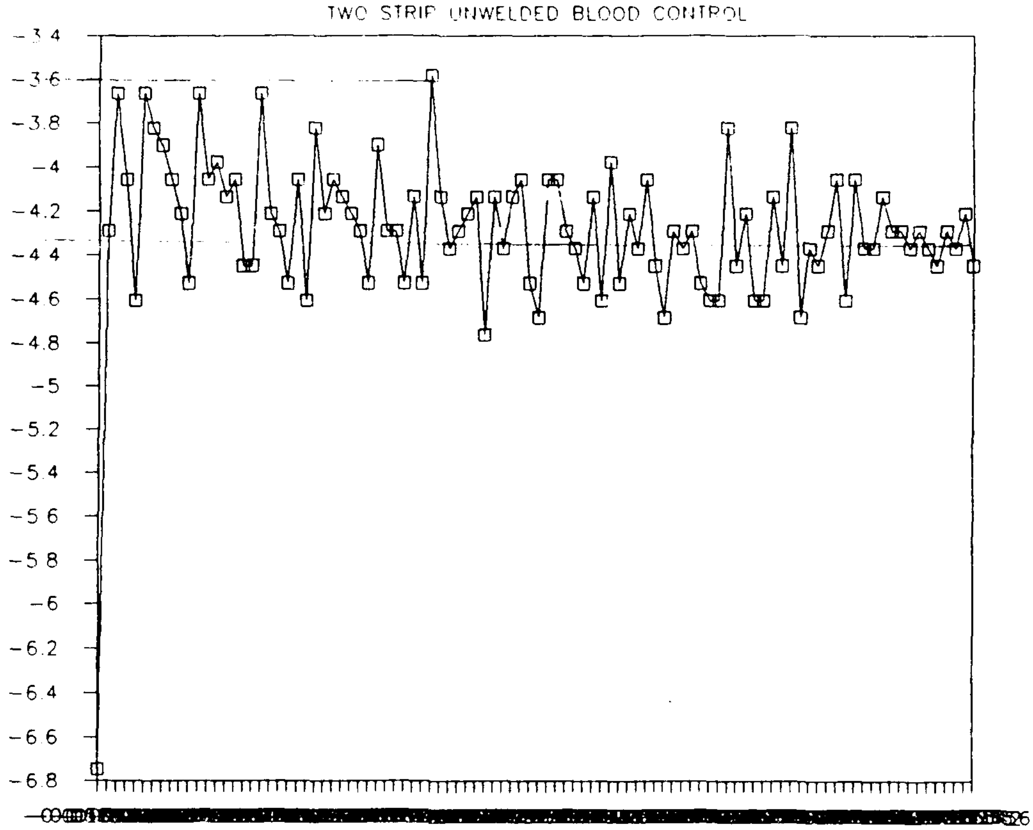
Ar++ Laser

Settings: Current Control
32A, 6.0W

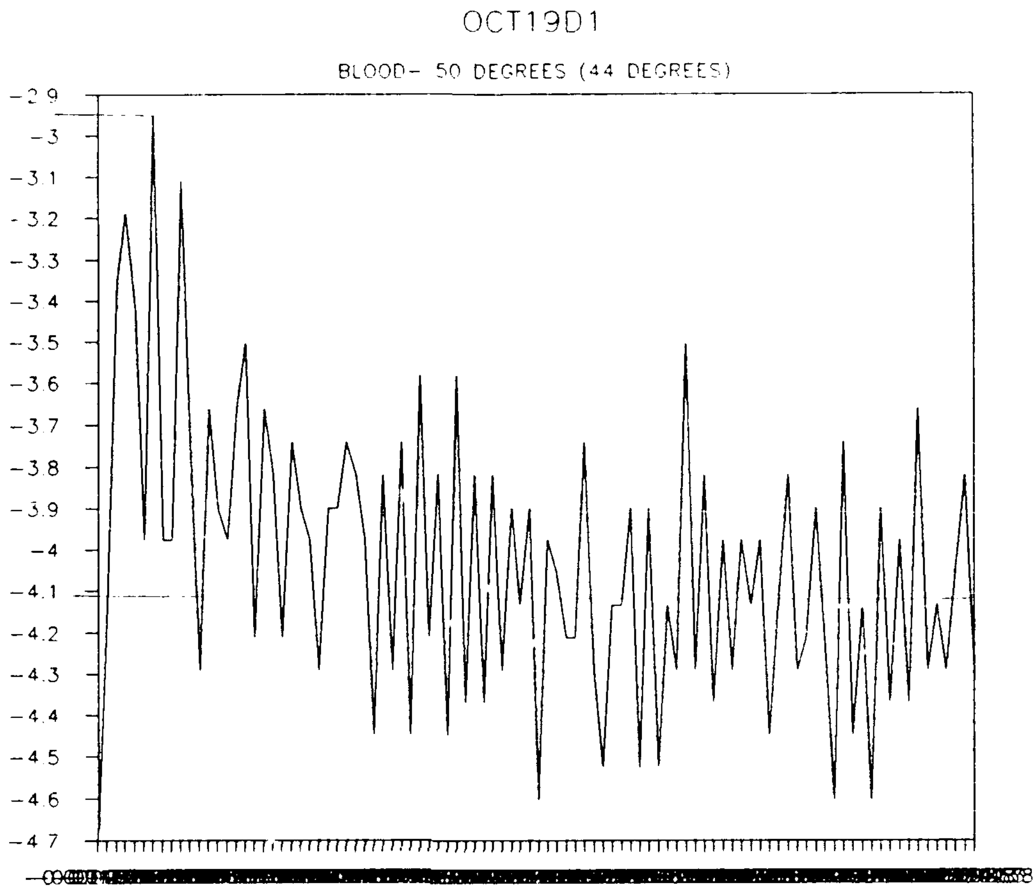
0.8W delivered
Small Aperture

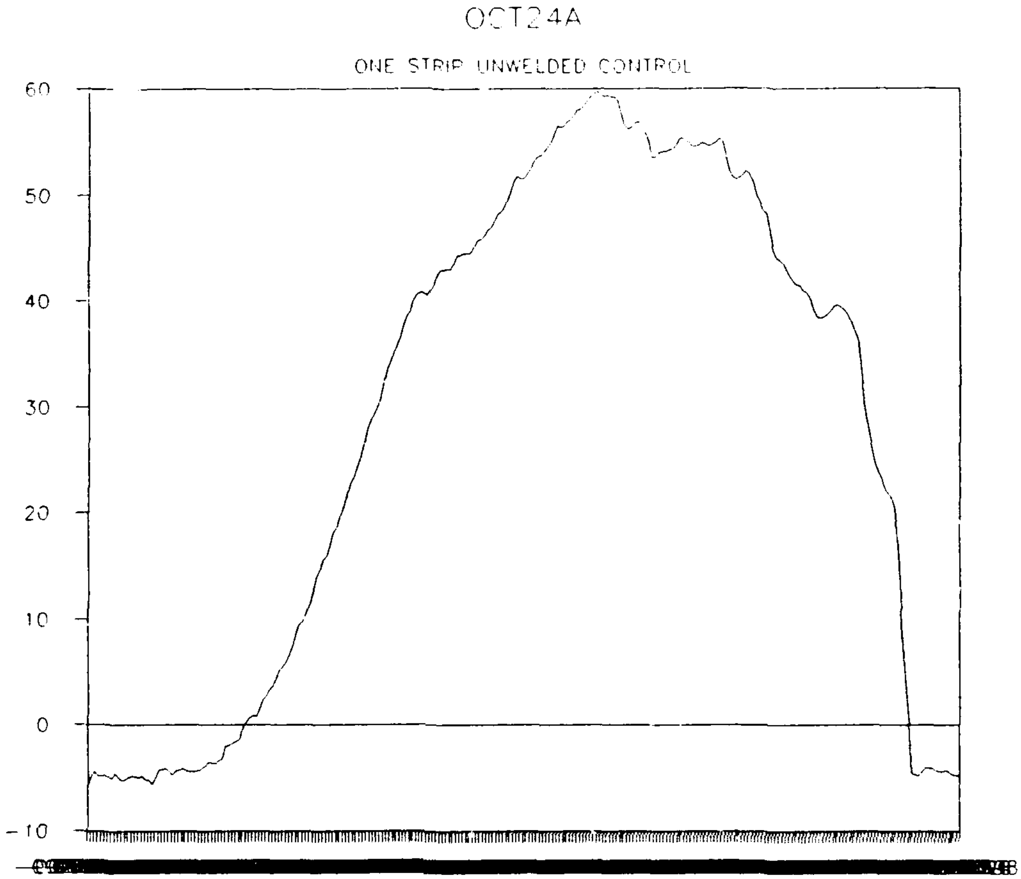

OCT19B
TWO STRIP UNWELDED CONTROL
-3.5
-4
-4.5
-5
-5.5
-6
-6.5
-7
-7.5

OCT19C


TWO STRIP UNWELDED BLOOD CONTROL
-3.4
-3.6
-3.8
-4
-4.2
-4.4
-4.6
-4.8
-5
-5.2
-5.4
-5.6
-5.8
-6
-6.2
-6.4
-6.6
-6.8

C.35


OCT19D1
BLOOD- 50 DEGREES (44 DEGREES)
-2.9
-3
-3.1
-3.2
-3.3
-3.4
-3.5
-3.6
-3.7
-3.8
-3.9
-4
-4.1
-4.2
-4.3
-4.4
-4.5
-4.6
-4.7



For all trials on OCT 24, 1996

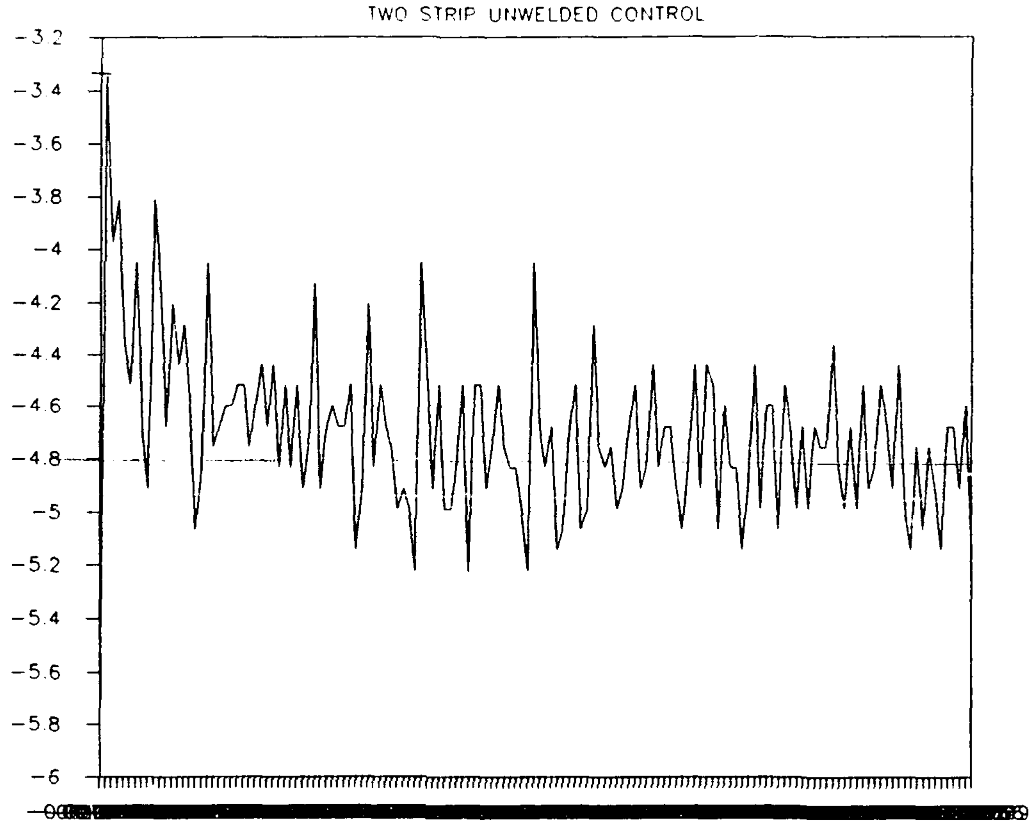
Ar^{++} Laser

Settings: Current Control

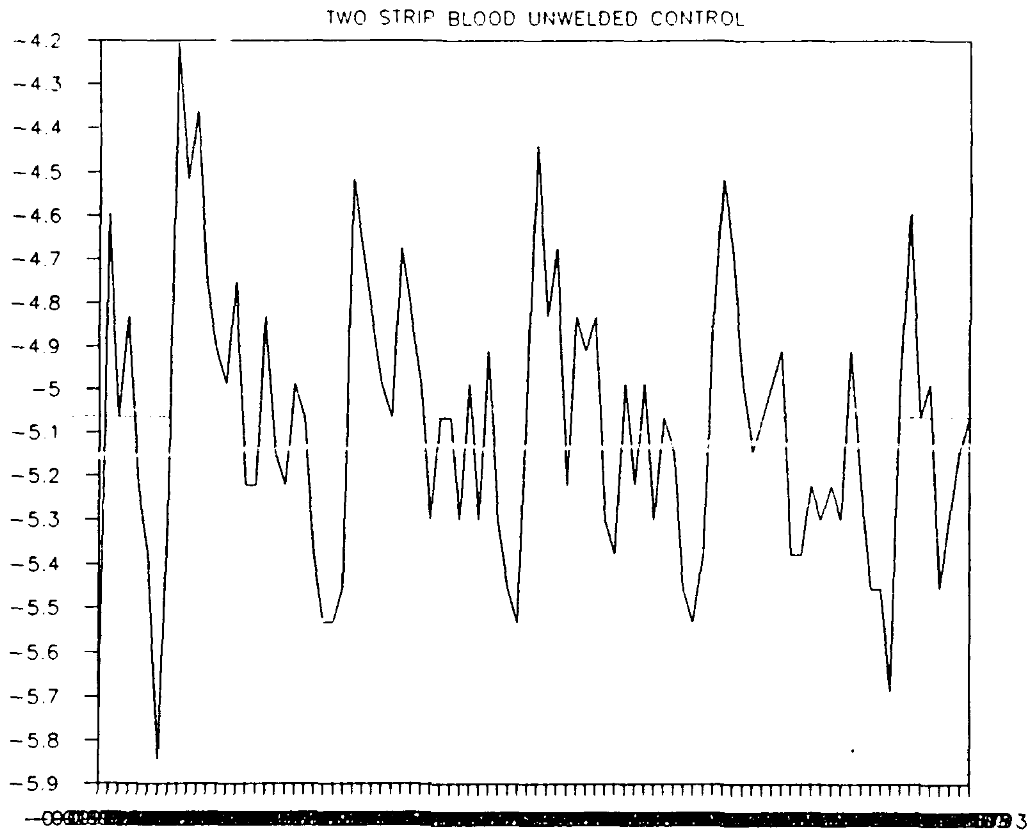
38A, 5.6W

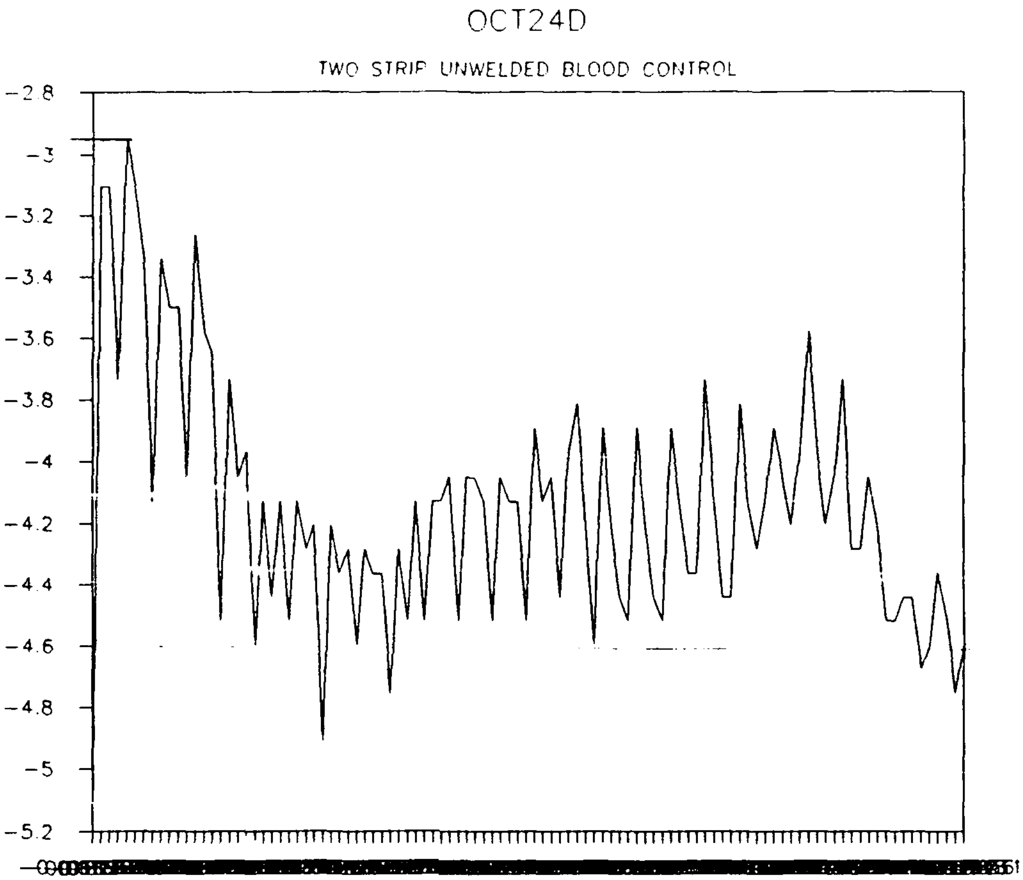
0.7 W delivered
Small Aperture

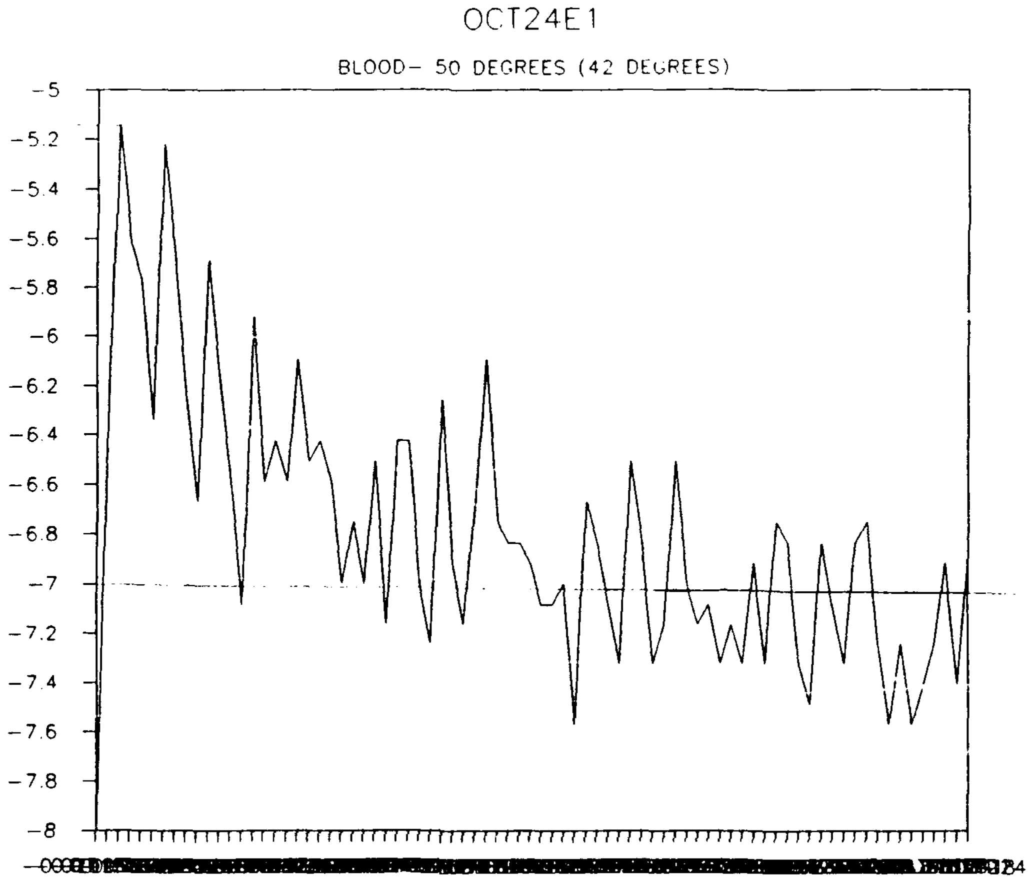
OCT24B


TWO STRIP UNWELDED CONTROL
-3.2
-3.4
-3.6
-3.8
-4
-4.2
-4.4
-4.6
-4.8
-5
-5.2
-5.4
-5.6
-5.8
-6

OCT24C


TWO STRIP BLOOD UNWELDED CONTROL
-4.2
-4.3
-4.4
-4.5
-4.6
-4.7
-4.8
-4.9
-5
-5.1
-5.2
-5.3
-5.4
-5.5
-5.6
-5.7
-5.8
-5.9

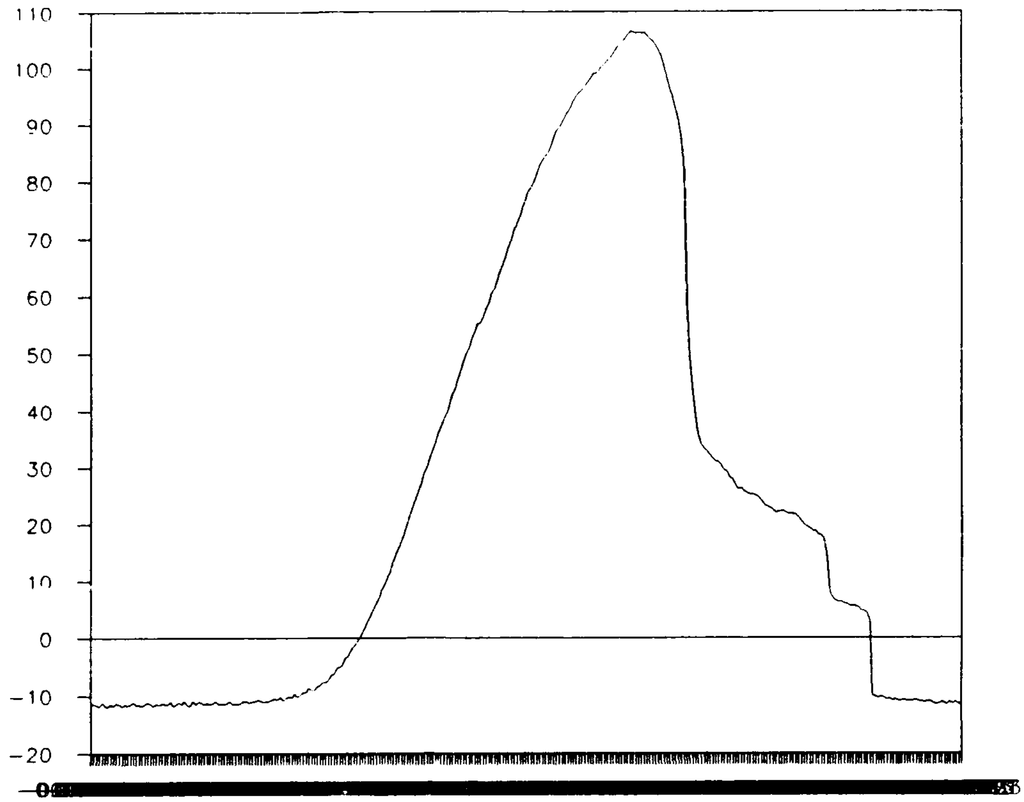

OCT24D
TWO STRIP UNWELDED BLOOD CONTROL
-2.8
-3
-3.2
-3.4
-3.6
-3.8
-4
-4.2
-4.4
-4.6
-4.8
-5
-5.2



OCT24E1
BLOOD- 50 DEGREES (42 DEGREES)
-5
-5.2
-5.4
-5.6
-5.8
-6
-6.2
-6.4
-6.6
-6.8
-7
-7.2
-7.4
-7.6
-7.8
-8

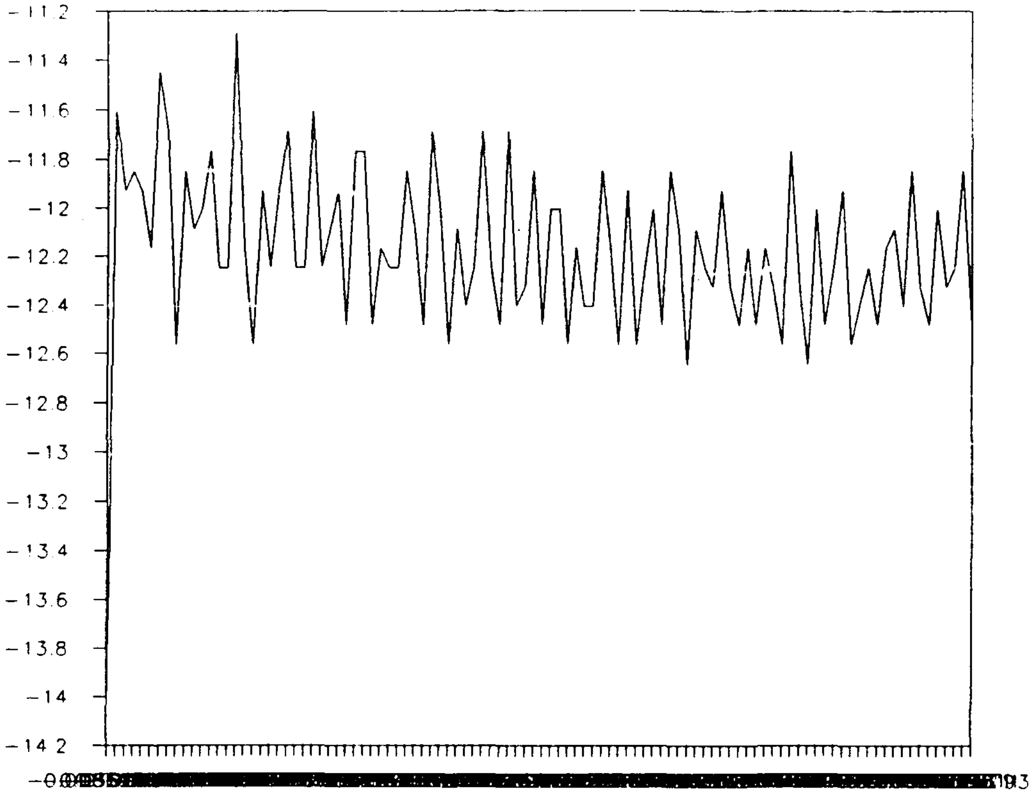
NOV8A– ONE STRIP CONTROL

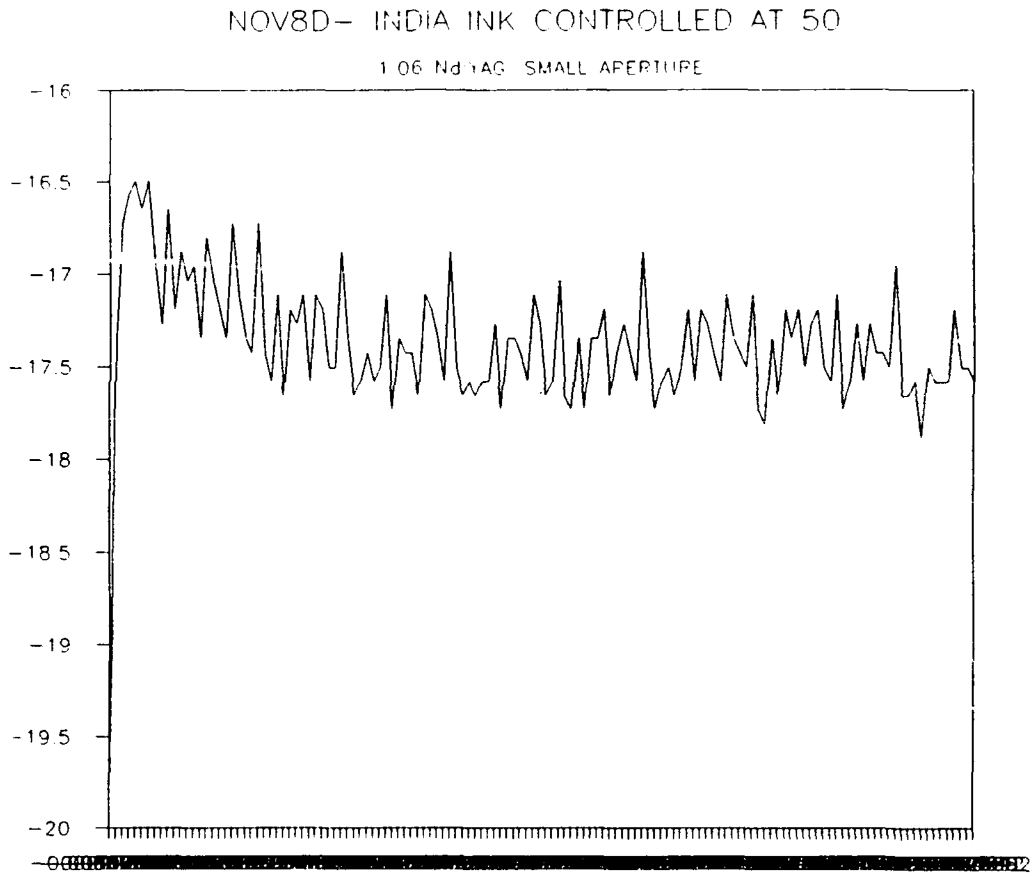
1.06 Nd:YAG, SMALL APERTURE, 5W

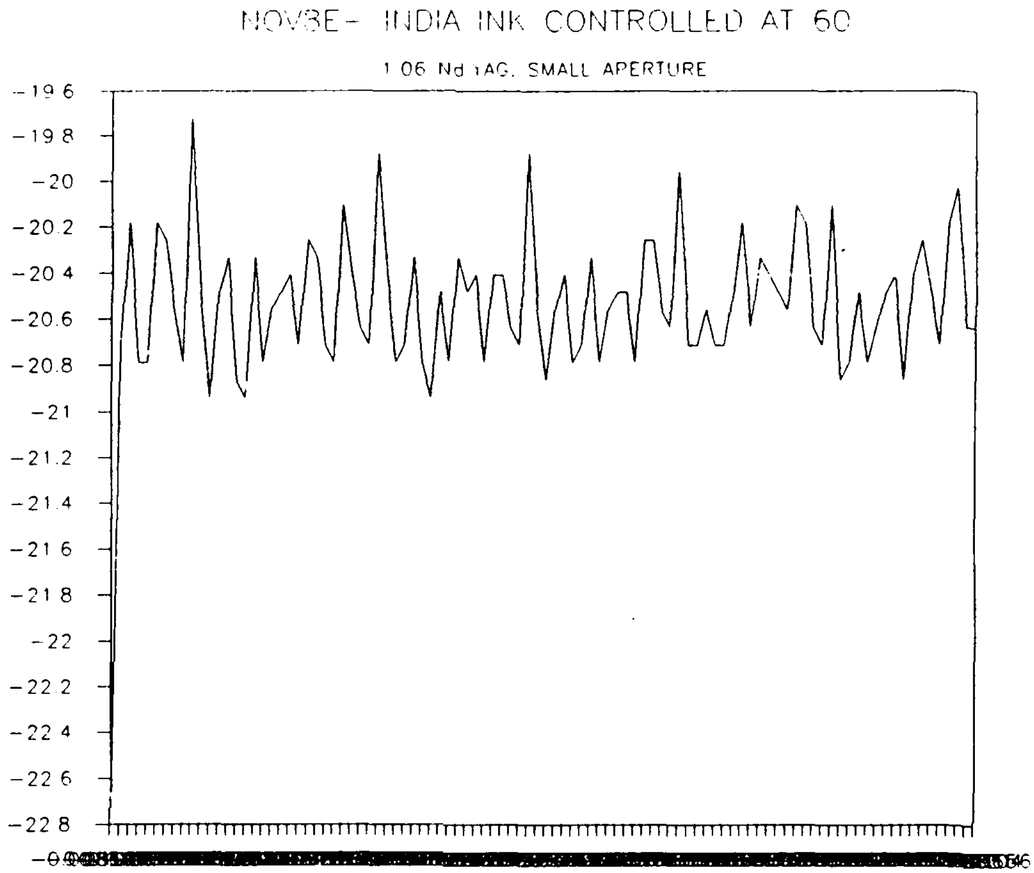


NOV8C– INDIA INK UNWELDED CONTROL

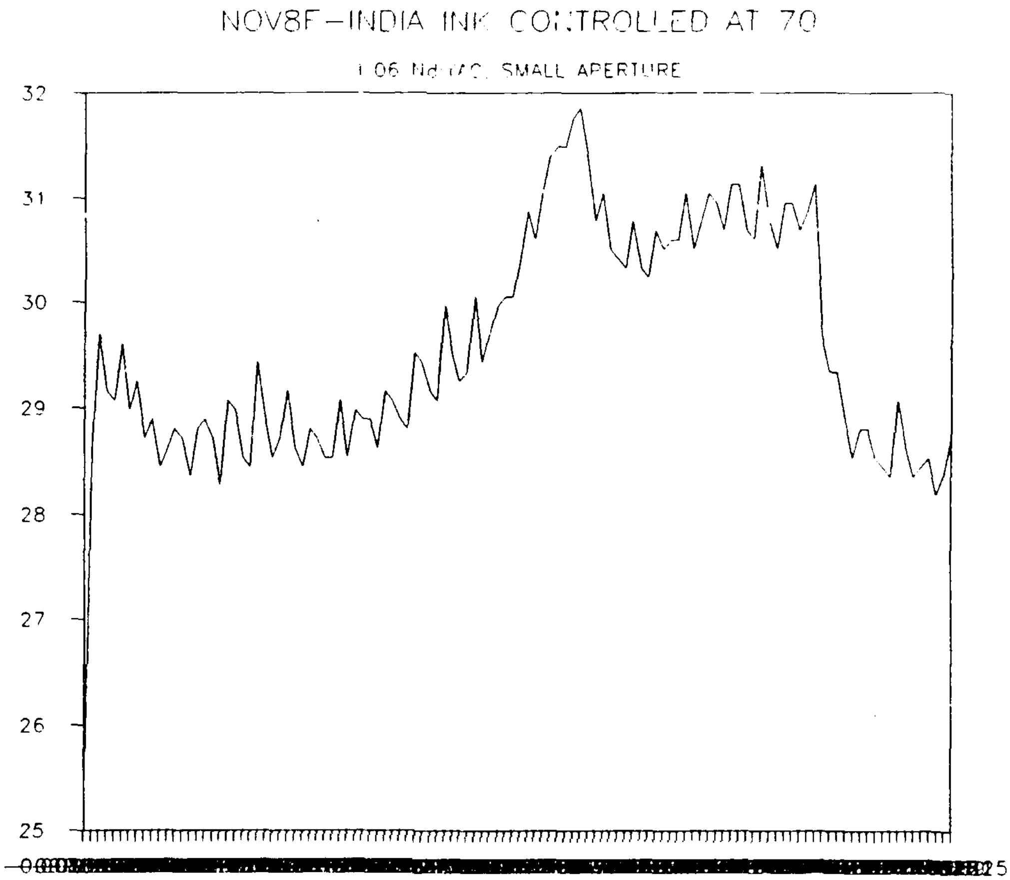
1.06 Nd YAG, SMALL APERTURE




NOV8D– INDIA INK CONTROLLED AT 50
1 06 Nd YAG SMALL APERTURE
-16
-16.5
-17
-17.5
-18
-18.5
-19
-19.5
-20

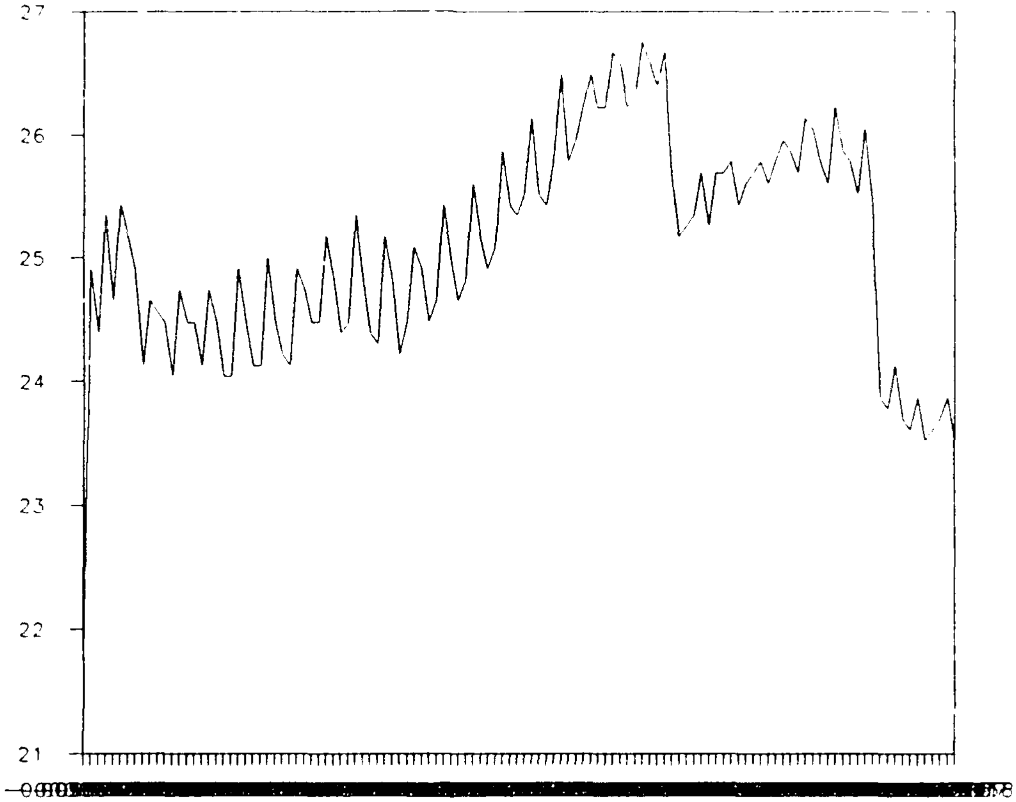


NOV3E- INDIA INK CONTROLLED AT 60
1.06 Nd YAG, SMALL APERTURE
-19.6
-19.8
-20
-20.2
-20.4
-20.6
-20.8
-21
-21.2
-21.4
-21.6
-21.8
-22
-22.2
-22.4
-22.6
-22.8


NOV8F–INDIA INK CONTROLLED AT 70
1.06 Nd YAG, SMALL APERTURE
32
31
30
29
28
27
26
25

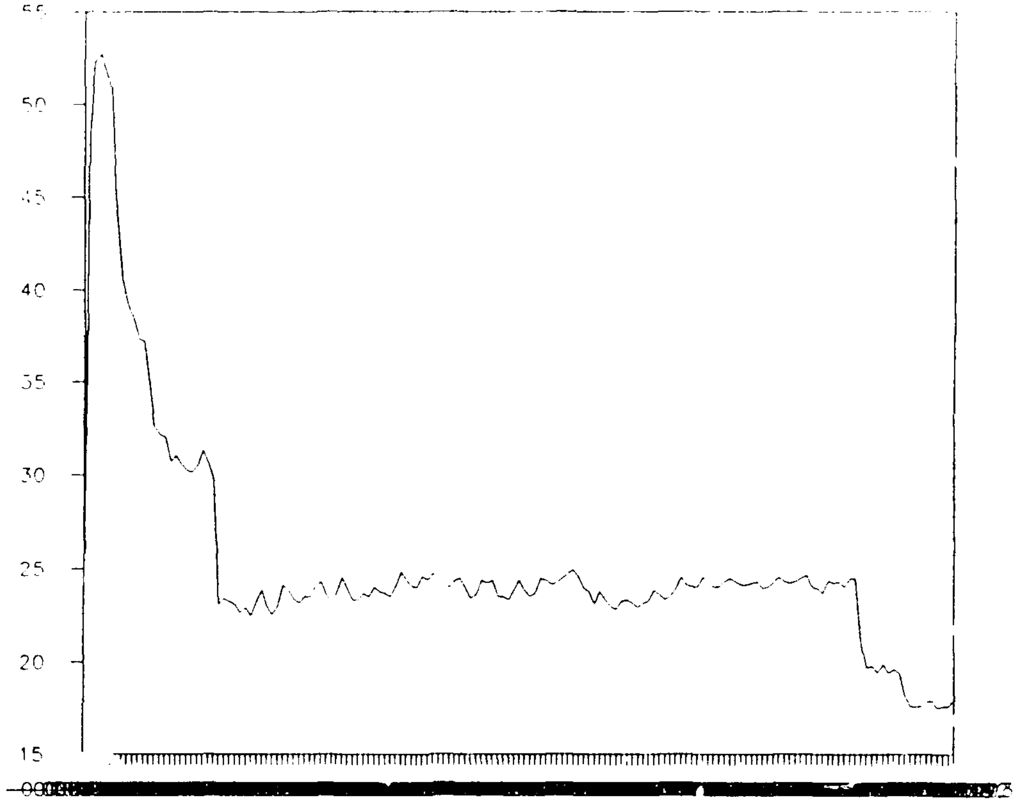
NOV3G–INDIA INK CONTROLLED AT 80

1.06 Nd YAG, SMALL APERTURE



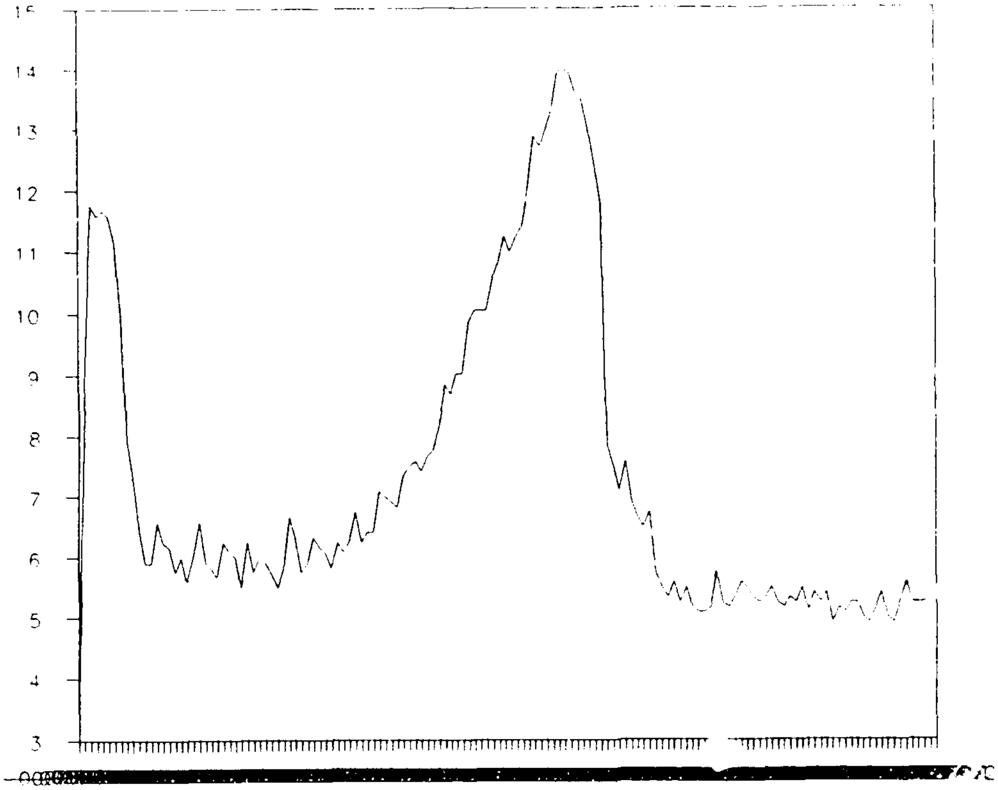
NOV8H-INDIA INK CONTROLLED AT 100

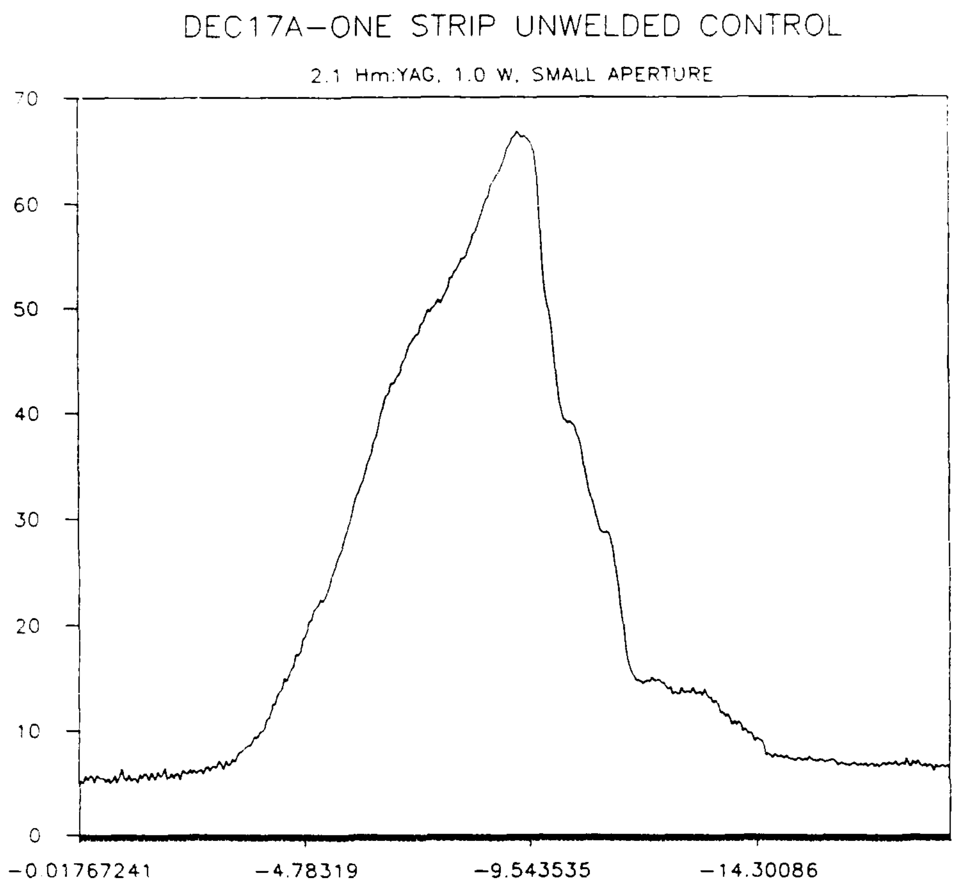
1.06 Nd:YAG, SMALL APERTURE

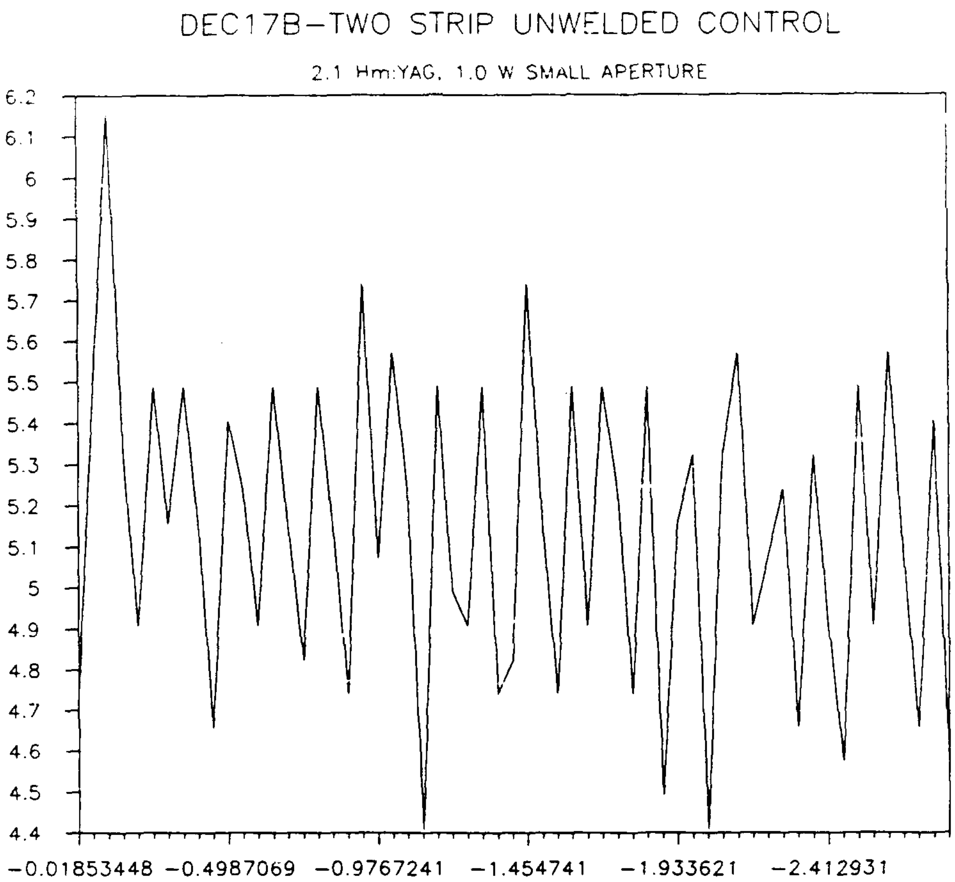


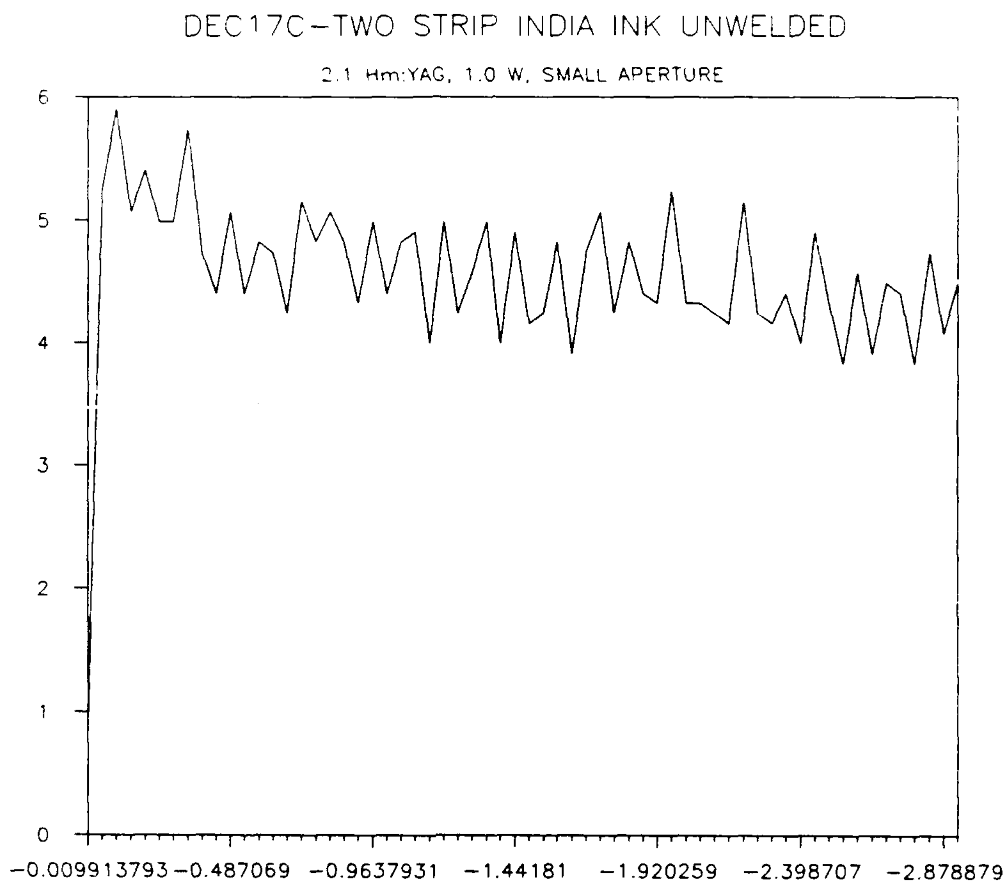
NOV8.1--INDIA INK CONTROLLED AT 100

1.06 Nd YAG, SMALL APERTURE

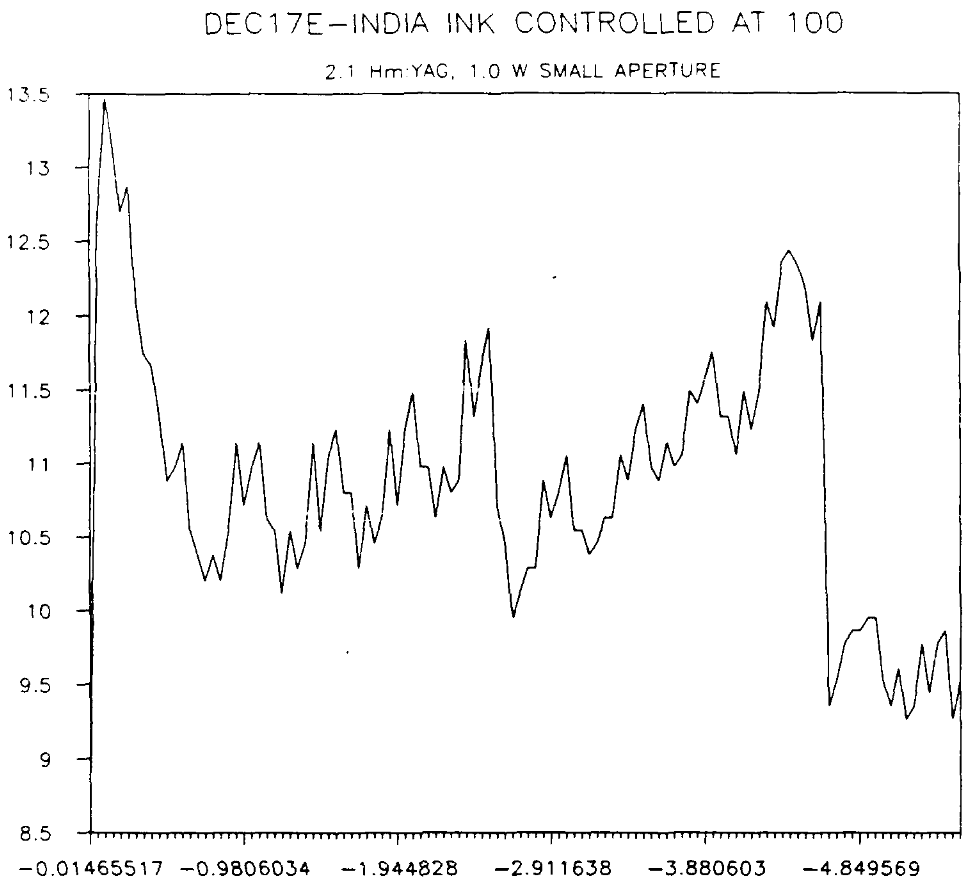



DEC17A–ONE STRIP UNWELDED CONTROL
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
70
60
50
40
30
20
10
0
–0.01767241
–4.78319
–9.543535
–14.30086


DEC17B–TWO STRIP UNWELDED CONTROL
2.1 Hm:YAG, 1.0 W SMALL APERTURE
6.2
6.1
6
5.9
5.8
5.7
5.6
5.5
5.4
5.3
5.2
5.1
5
4.9
4.8
4.7
4.6
4.5
4.4
–0.01853448
–0.4987069
–0.9767241
–1.454741
–1.933621
–2.412931

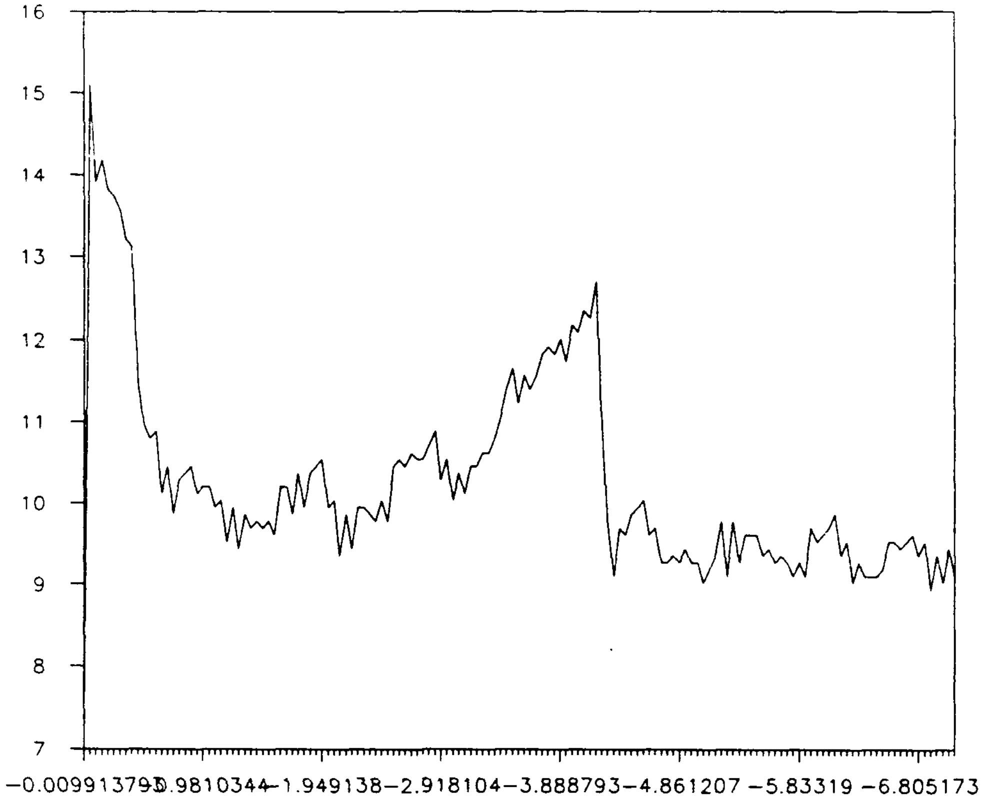


DEC17C-TWO STRIP INDIA INK UNWELDED
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
6
5
4
3
2
1
0
-0.009913793
-0.487069
-0.9637931
-1.44181
-1.920259
-2.398707
-2.878879


DEC17E-INDIA INK CONTROLLED AT 100
2.1 Hm:YAG, 1.0 W SMALL APERTURE
13.5
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
-0.01465517
-0.9806034
-1.944828
-2.911638
-3.880603
-4.849569

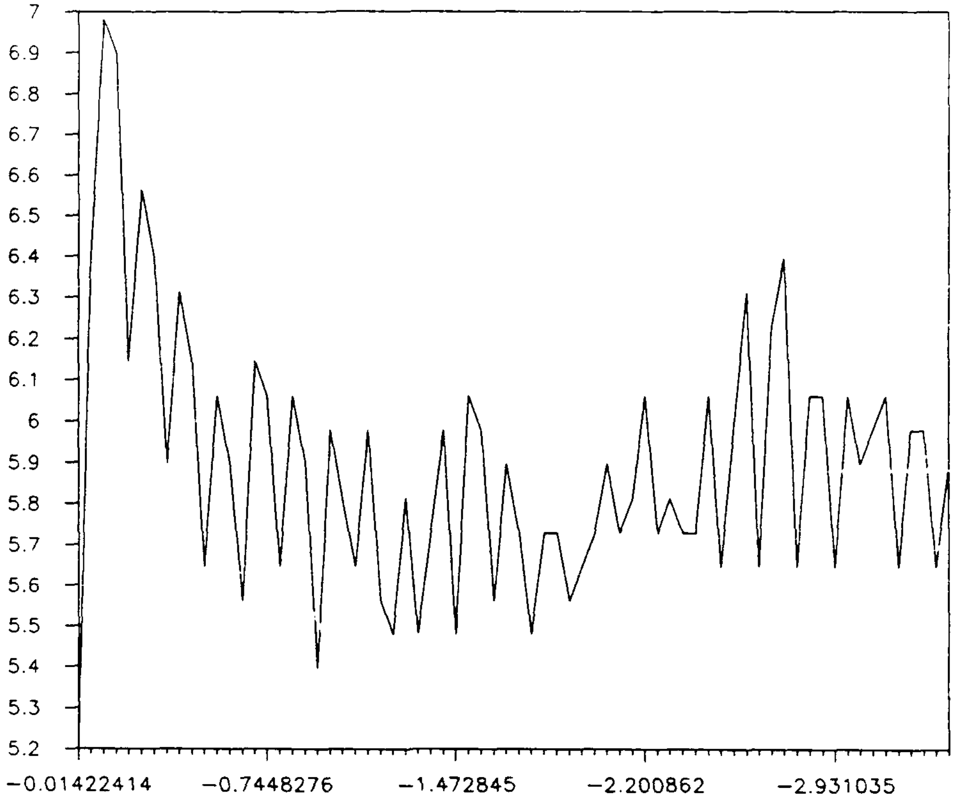
DEC17F- NO CHROMO SET=100, TC MAX=70

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



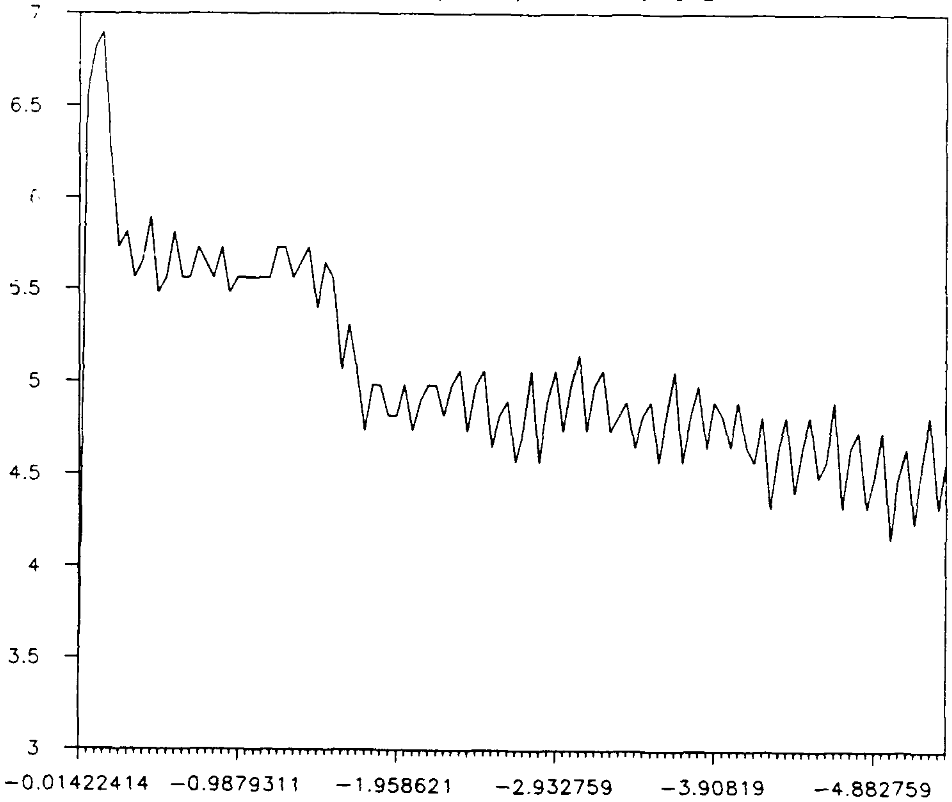
DEC17G–INDIA INK CONTROLLED AT 50, 10s

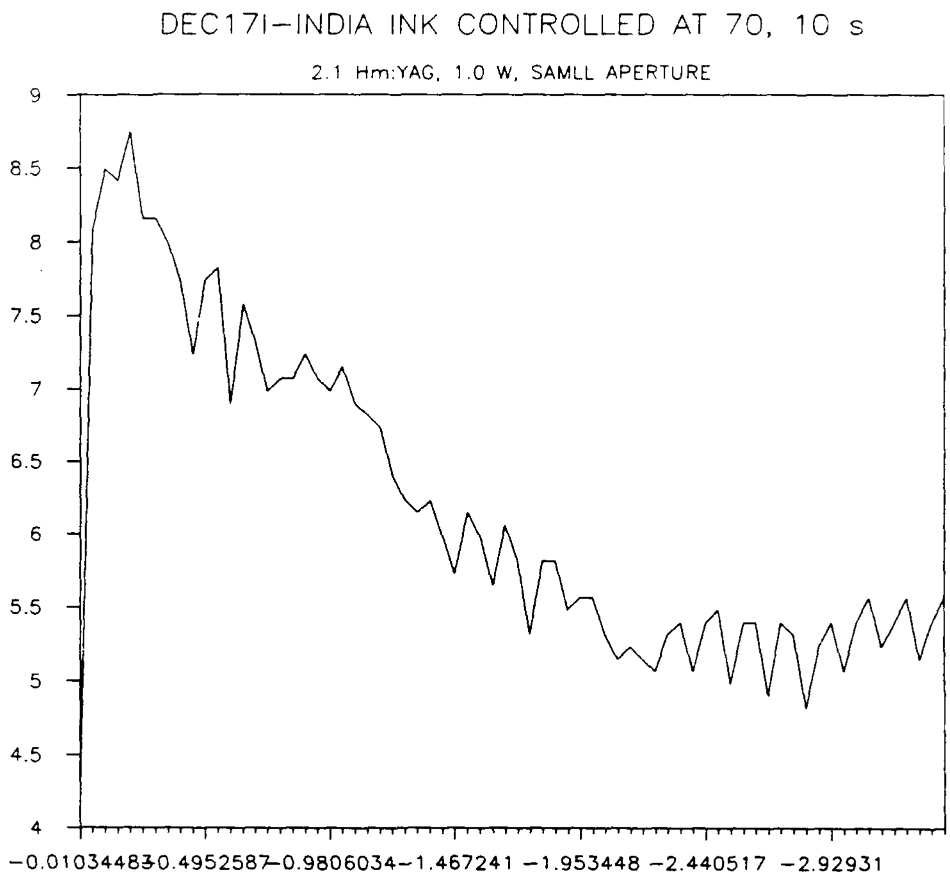
2.1 Hm:YAG, 1.0 W, SMALL APERTURE



DEC17H–INDIA INK CONTROLLED AT 60, 10 s

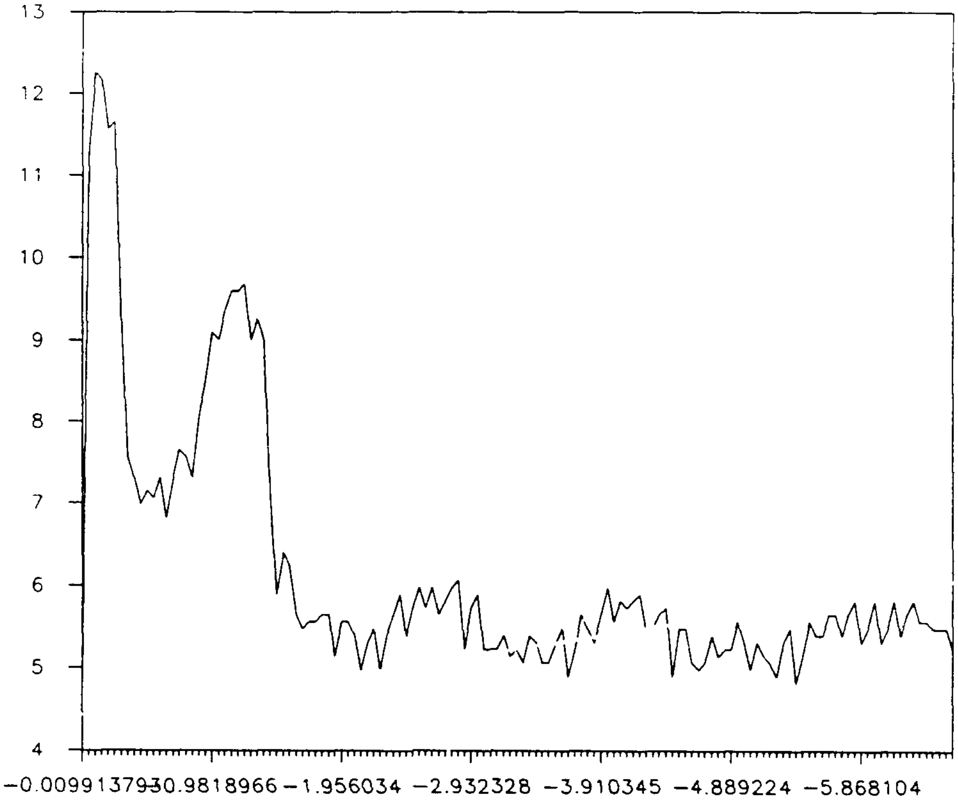
2.1 Hm:YAG, 1.0 W, SMALL APERTURE

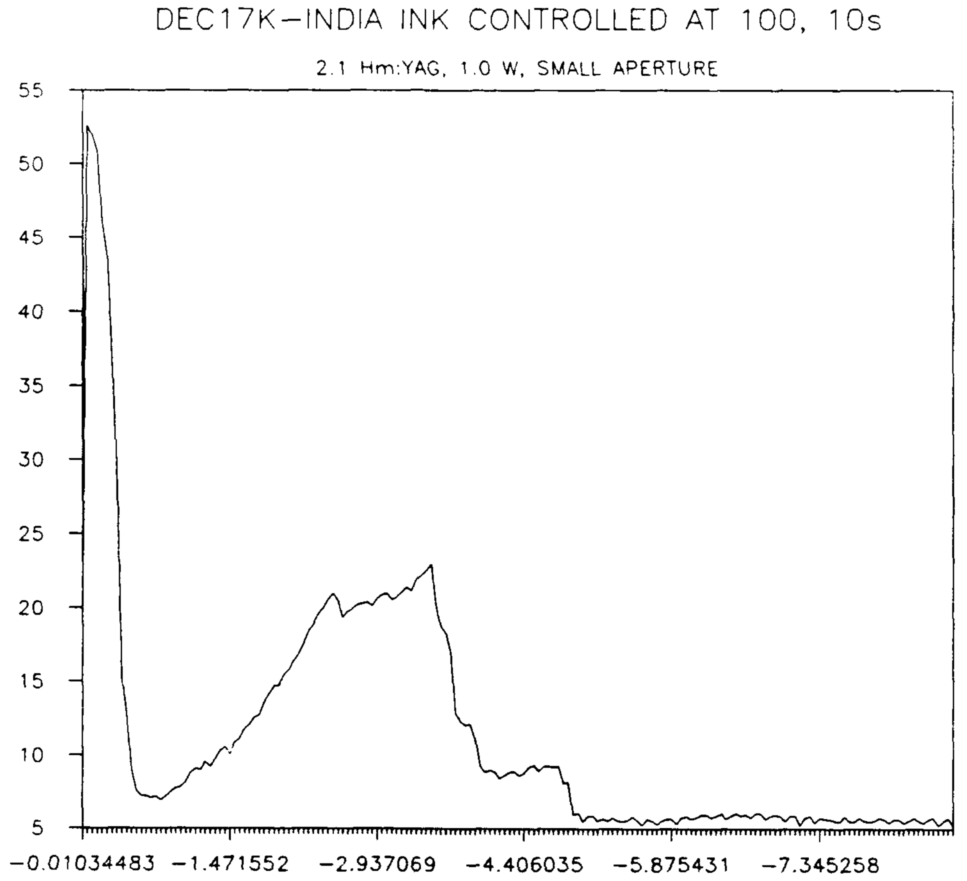


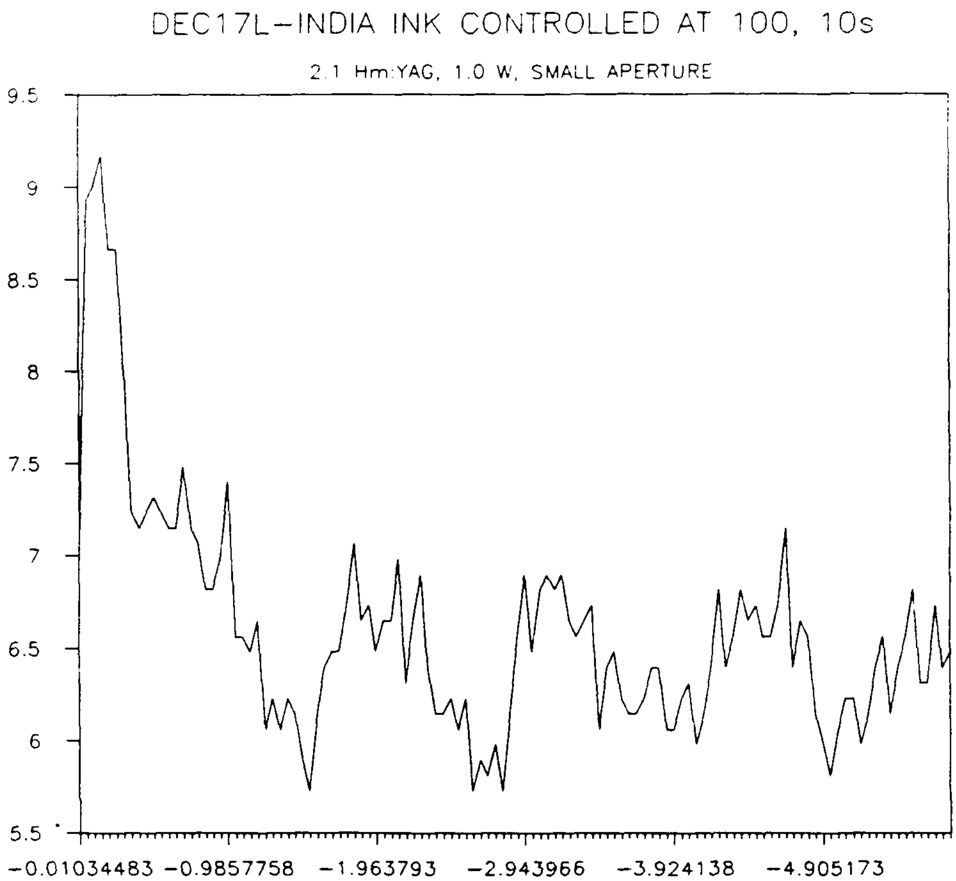

DEC17I–INDIA INK CONTROLLED AT 70, 10 s
2.1 Hm:YAG, 1.0 W, SAMLL APERTURE
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
–0.010344830.4952587–0.9806034–1.467241 –1.953448 –2.440517 –2.92931

DEC17J–INDIA INK CONTROLLED AT 80, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE

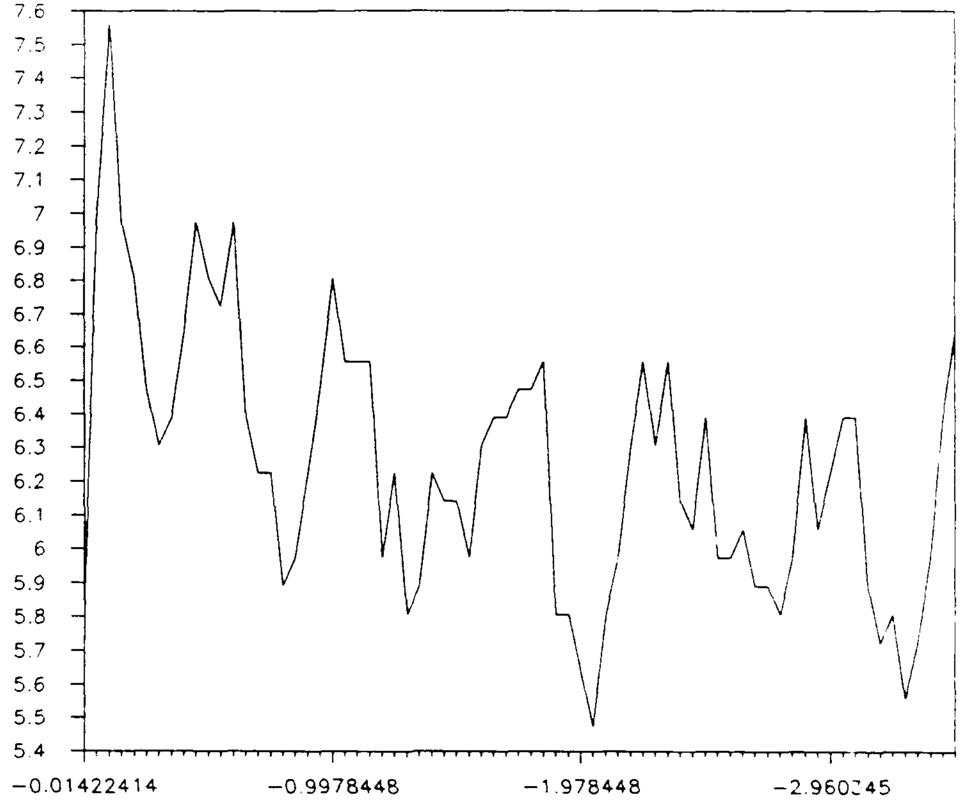



DEC17K—INDIA INK CONTROLLED AT 100, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
55
50
45
40
35
30
25
20
15
10
5
−0.01034483
−1.471552
−2.937069
−4.406035
−5.875431
−7.345258


DEC17L-INDIA INK CONTROLLED AT 100, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
9.5
9
8.5
8
7.5
7
6.5
6
5.5
-0.01034483
-0.9857758
-1.963793
-2.943966
-3.924138
-4.905173

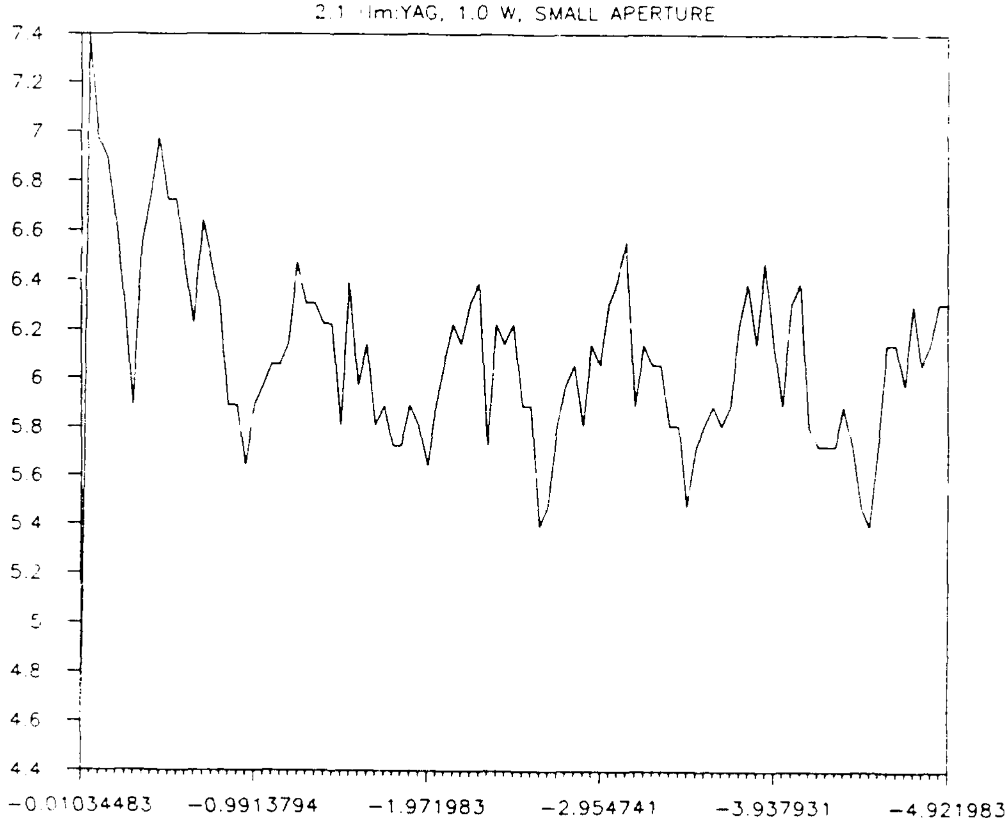
DEC17M-NO CHROMO, CONTROLLED AT 50, 10s

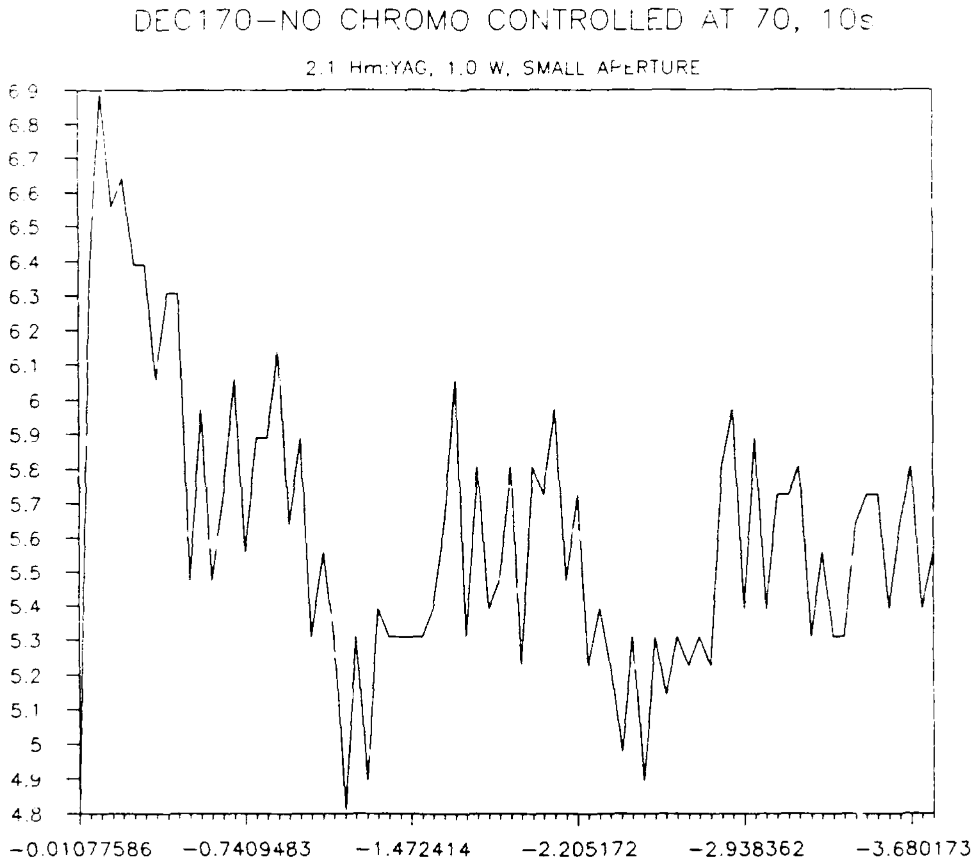
2.1 Hm:YAG, 1.0 W, SMALL APERTURE

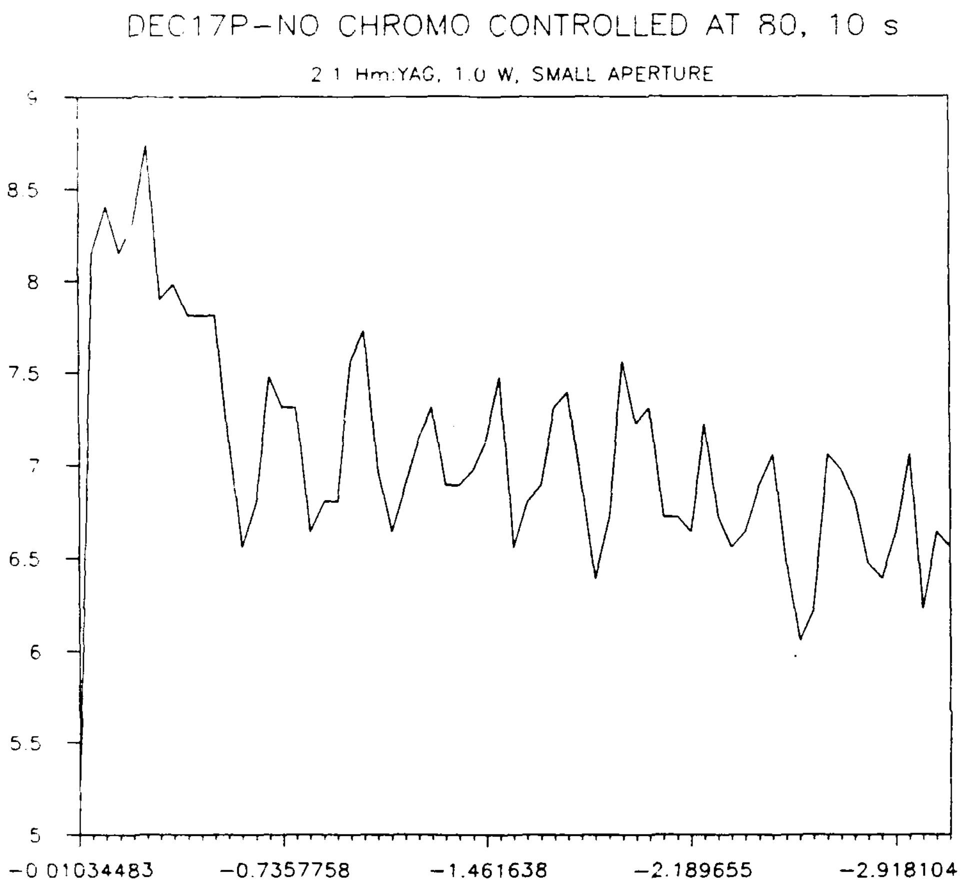


DEC17N-NO CHROMO CONTROLLED AT 60, 10s

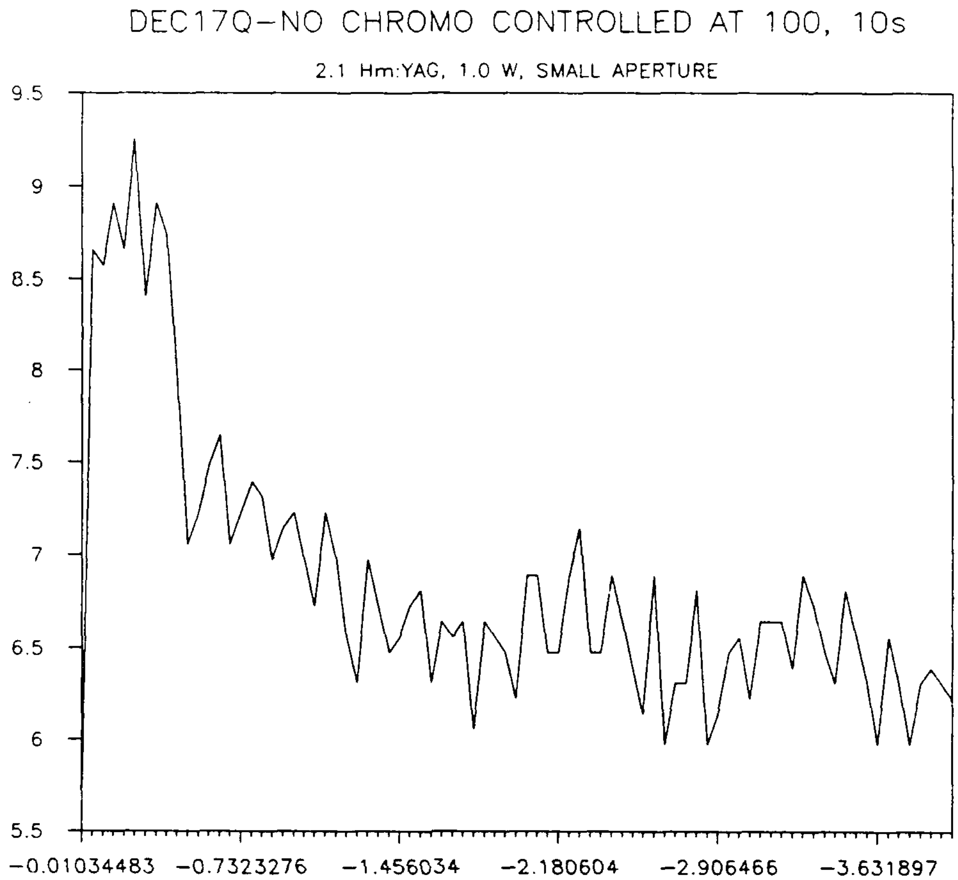
2.1 μm:YAG, 1.0 W, SMALL APERTURE

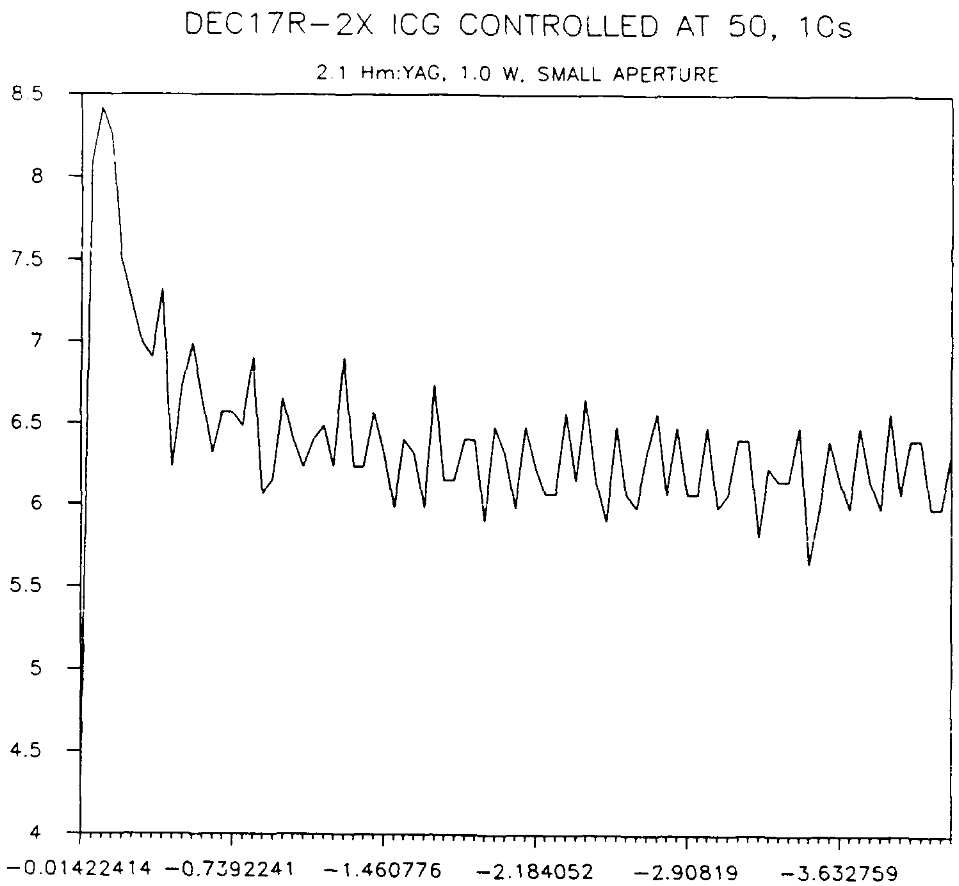



DEC170-NO CHROMO CONTROLLED AT 70, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
6.9
6.8
6.7
6.6
6.5
6.4
6.3
6.2
6.1
6
5.9
5.8
5.7
5.6
5.5
5.4
5.3
5.2
5.1
5
4.9
4.8
-0.01077586
-0.7409483
-1.472414
-2.205172
-2.938362
-3.680173

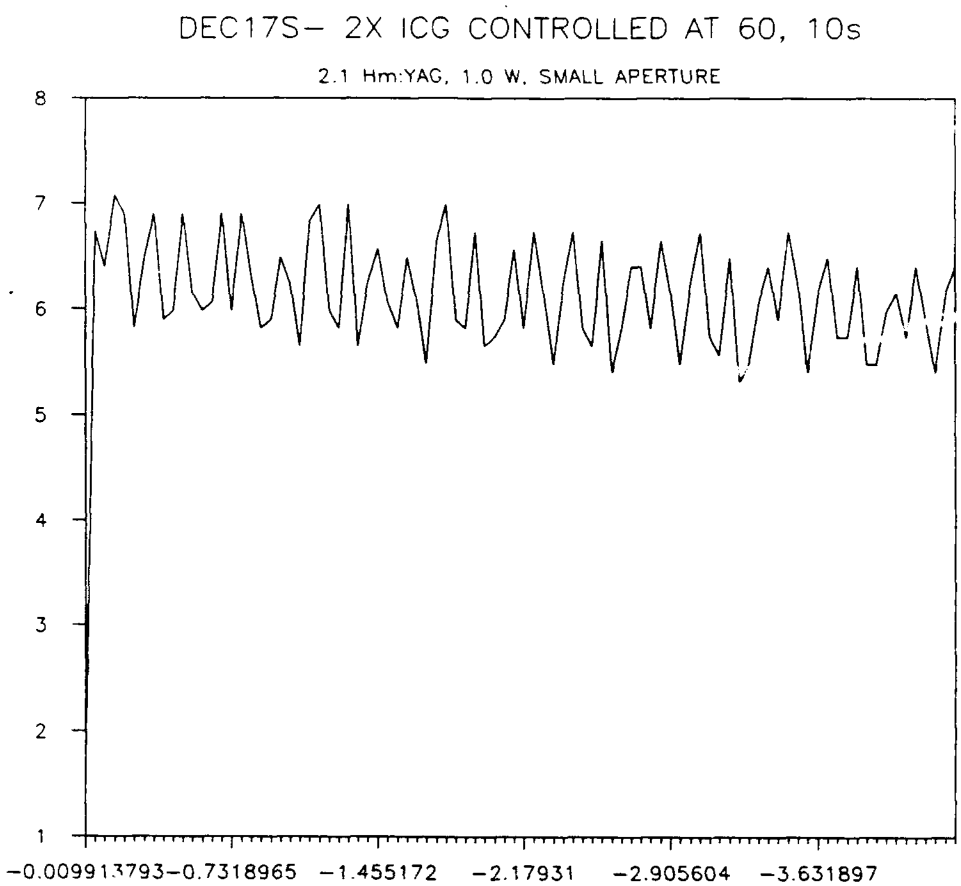


DEC17P-NO CHROMO CONTROLLED AT 80, 10 s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
9
8.5
8
7.5
7
6.5
6
5.5
5
-0.01034483
-0.7357758
-1.461638
-2.189655
-2.918104

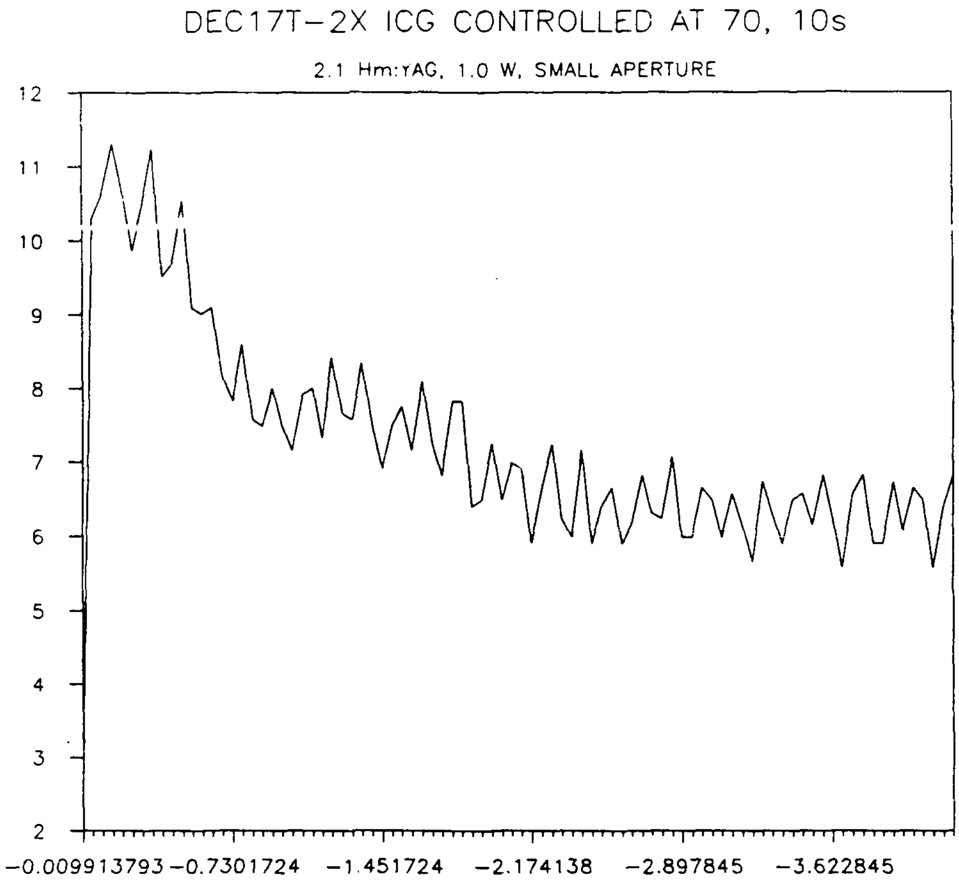

DEC17Q-NO CHROMO CONTROLLED AT 100, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
9.5
9
8.5
8
7.5
7
6.5
6
5.5
-0.01034483
-0.7323276
-1.456034
-2.180604
-2.906466
-3.631897

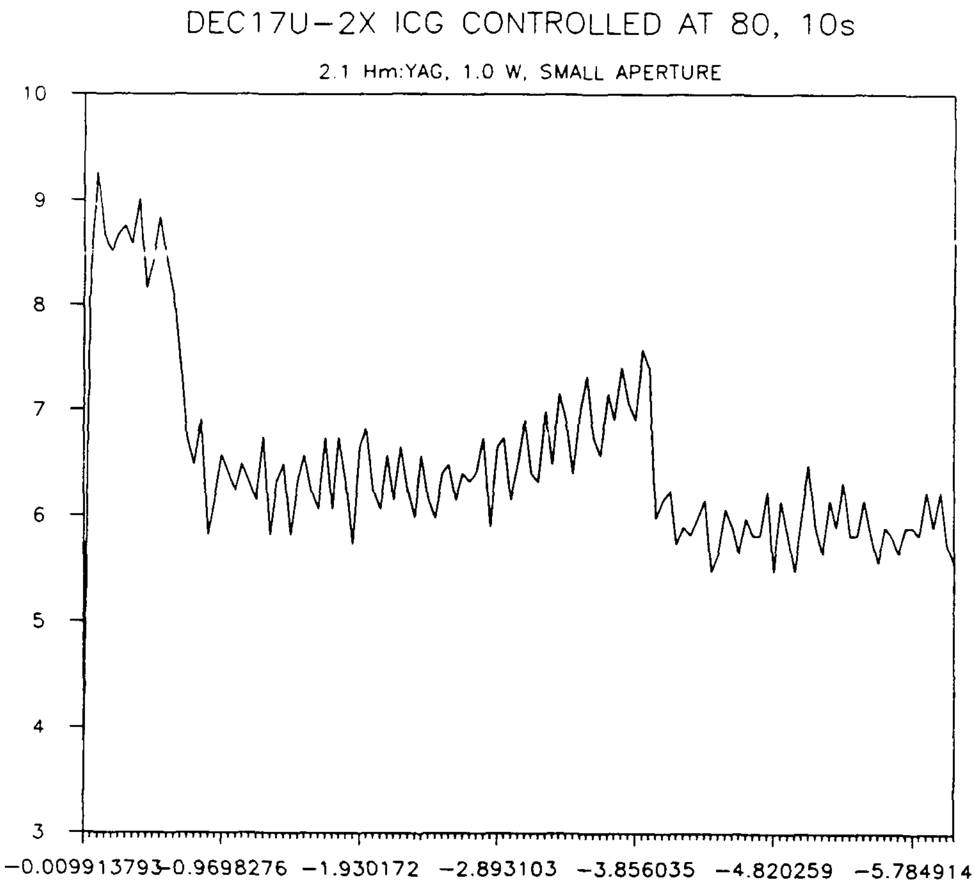


DEC17R-2X ICG CONTROLLED AT 50, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
-0.01422414
-0.7392241
-1.460776
-2.184052
-2.90819
-3.632759



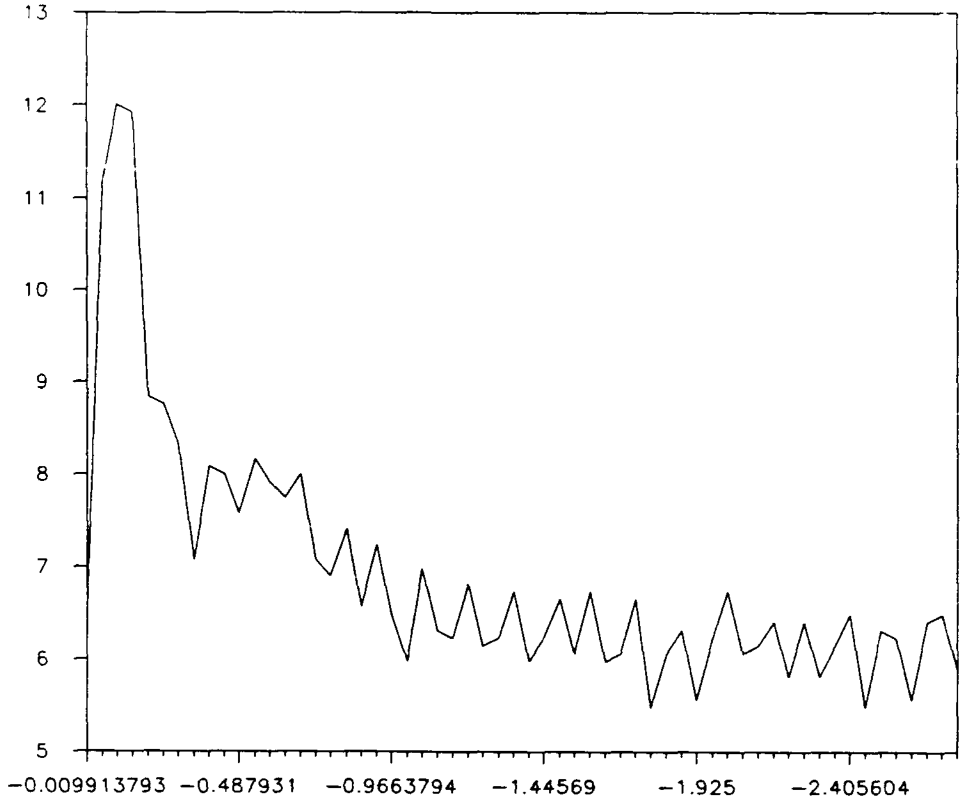
DEC17S– 2X ICG CONTROLLED AT 60, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
8
7
6
5
4
3
2
1
–0.009913793
–0.7318965
–1.455172
–2.17931
–2.905604
–3.631897

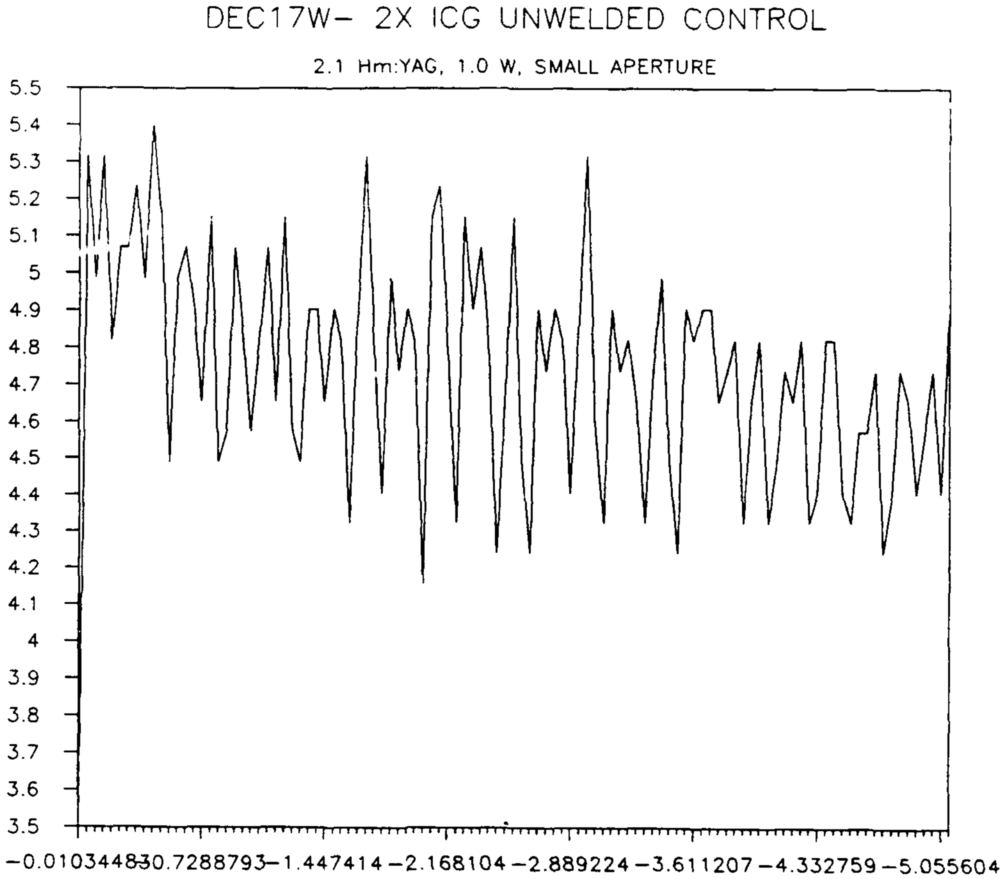

DEC17T-2X ICG CONTROLLED AT 70, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
12
11
10
9
8
7
6
5
4
3
2
-0.009913793
-0.7301724
-1.451724
-2.174138
-2.897845
-3.622845


DEC17U-2X ICG CONTROLLED AT 80, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
10
9
8
7
6
5
4
3
-0.009913793
-0.9698276
-1.930172
-2.893103
-3.856035
-4.820259
-5.784914

DEC17V-2X ICG SET AT 100, TC MAX=90,

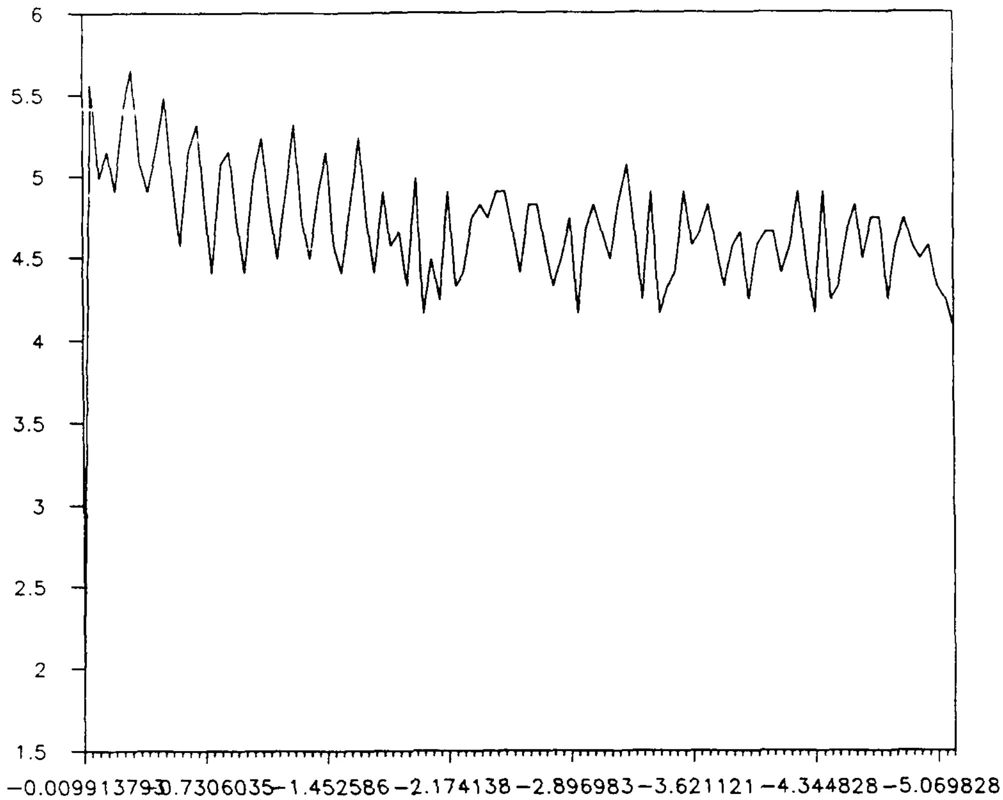
2.1 Hm:YAG, 1.0 W , SMALL APERTURE




DEC17W- 2X ICG UNWELDED CONTROL
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
5.5
5.4
5.3
5.2
5.1
5
4.9
4.8
4.7
4.6
4.5
4.4
4.3
4.2
4.1
4
3.9
3.8
3.7
3.6
3.5
-0.0103448
-0.7288793
-1.447414
-2.168104
-2.889224
-3.611207
-4.332759
-5.055604

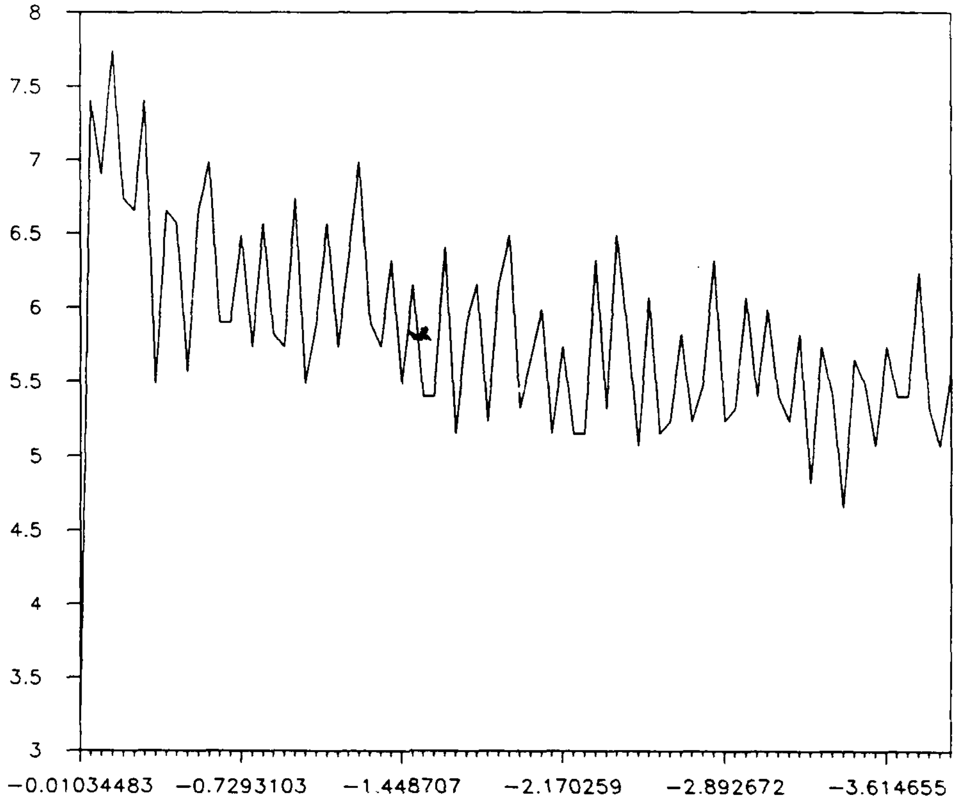
DEC17X-BLOOD UNWELDED CONTROL

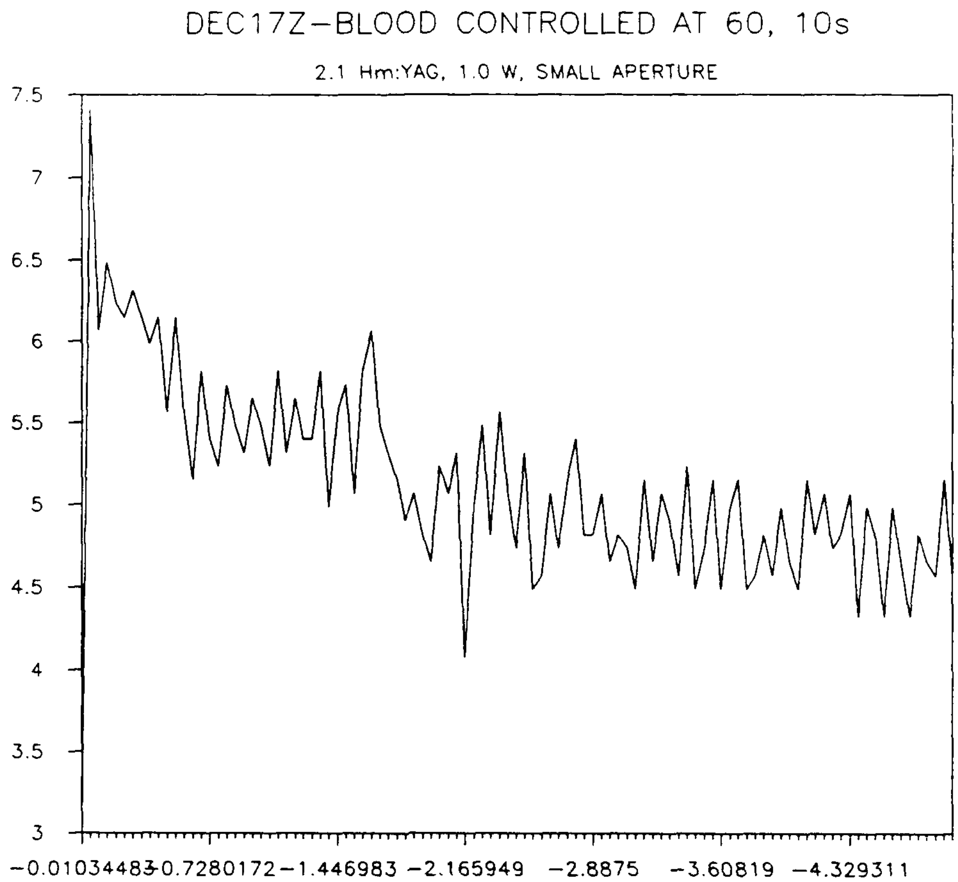
2.1 Hm:YAG, 1.0 W, SMALL APERTURE



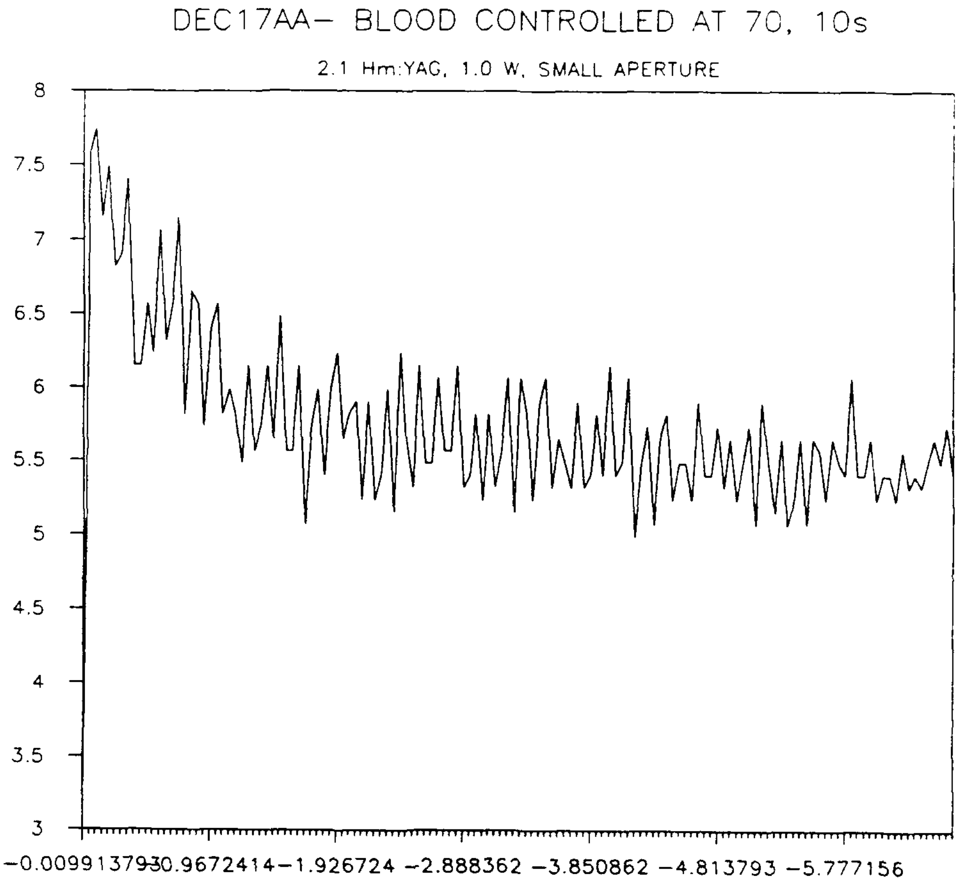
DEC17Y– BLOOD CONTROLLED AT 50, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



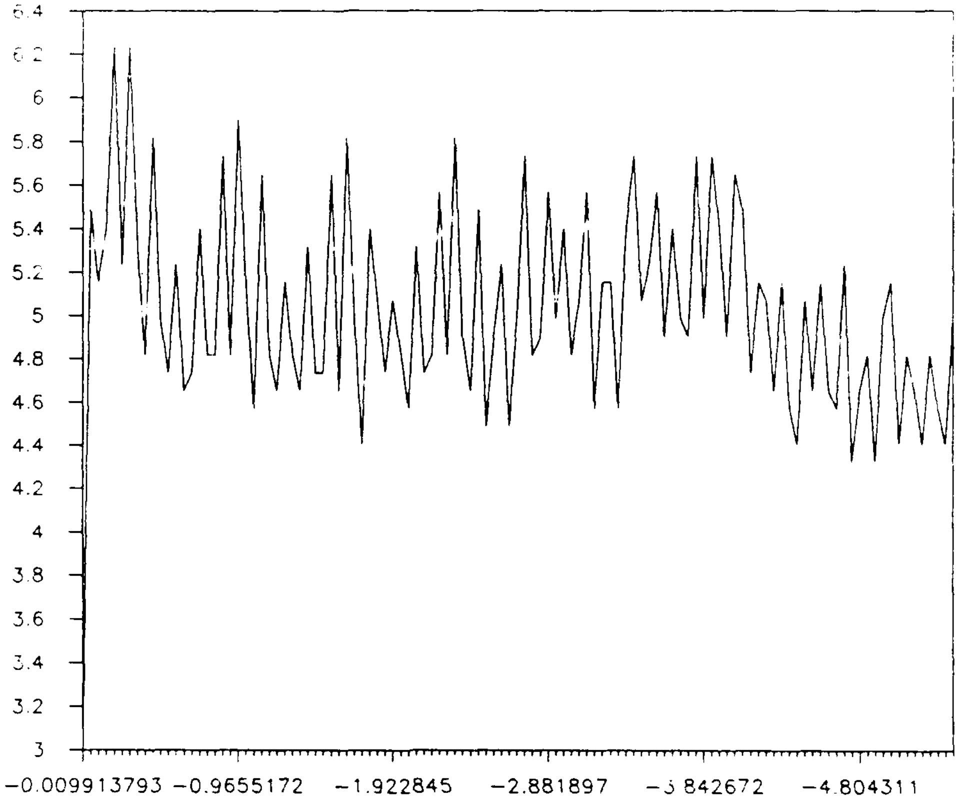


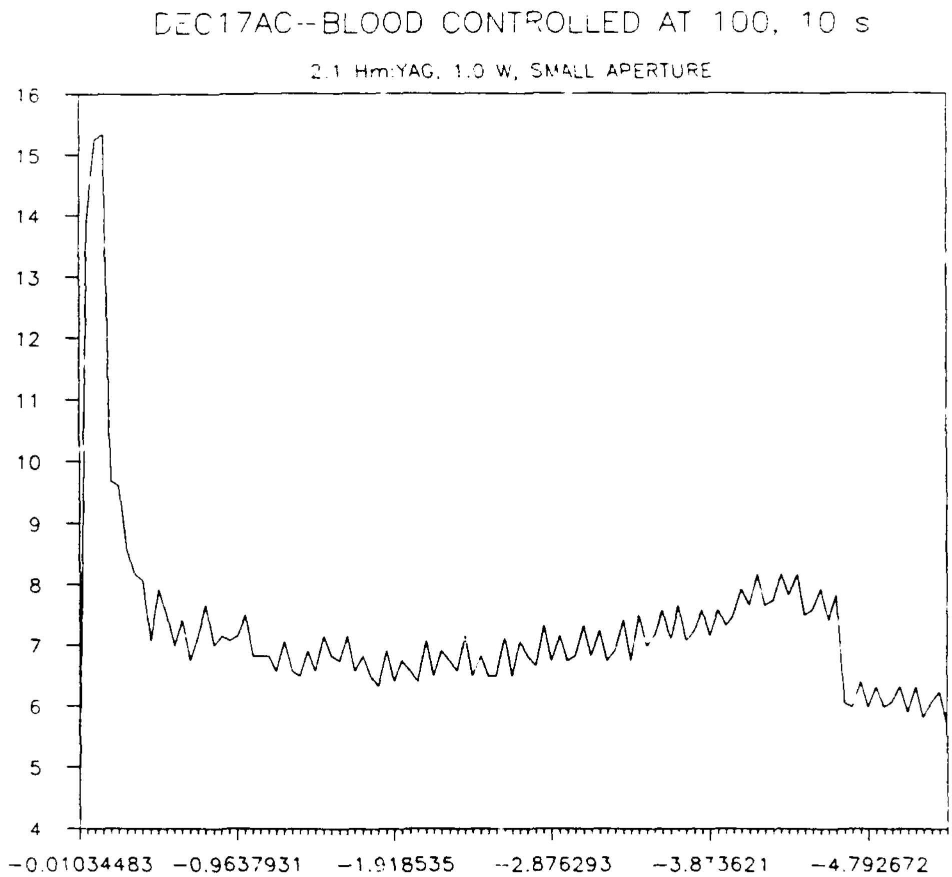
DEC17Z-BLOOD CONTROLLED AT 60, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
-0.01034483
-0.7280172
-1.446983
-2.165949
-2.8875
-3.60819
-4.329311


DEC17AA– BLOOD CONTROLLED AT 70, 10s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
–0.0099137930.9672414–1.926724 –2.888362 –3.850862 –4.813793 –5.777156

DEC17AB- BLOOD CONTROLLED AT 80, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE

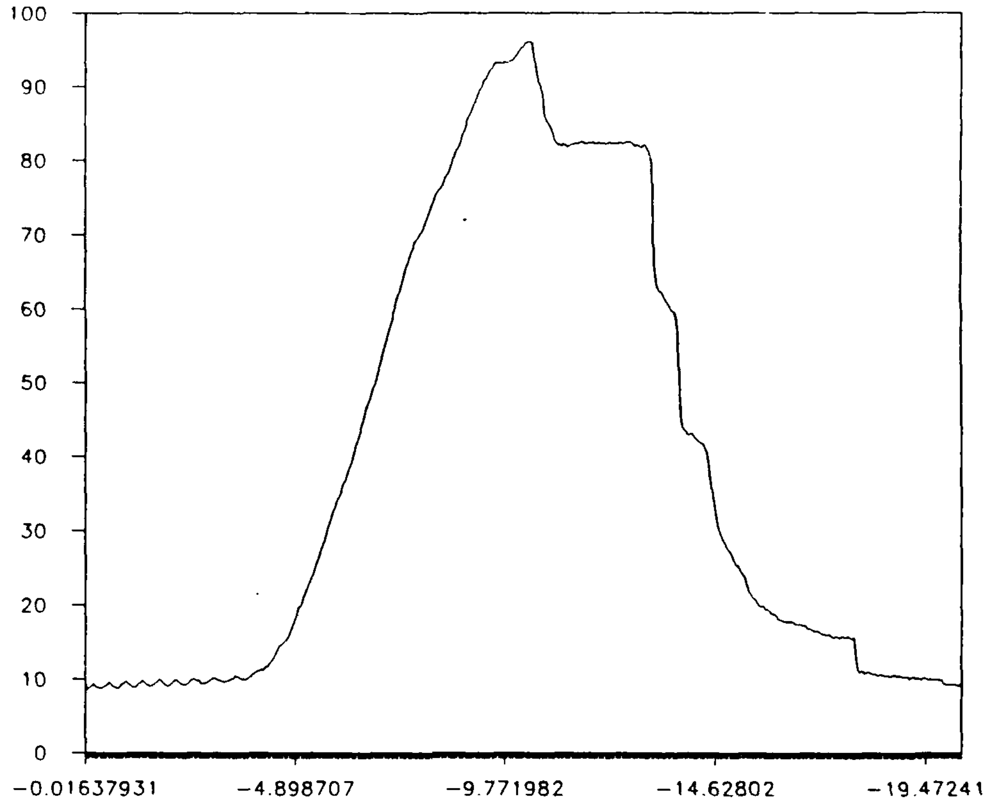


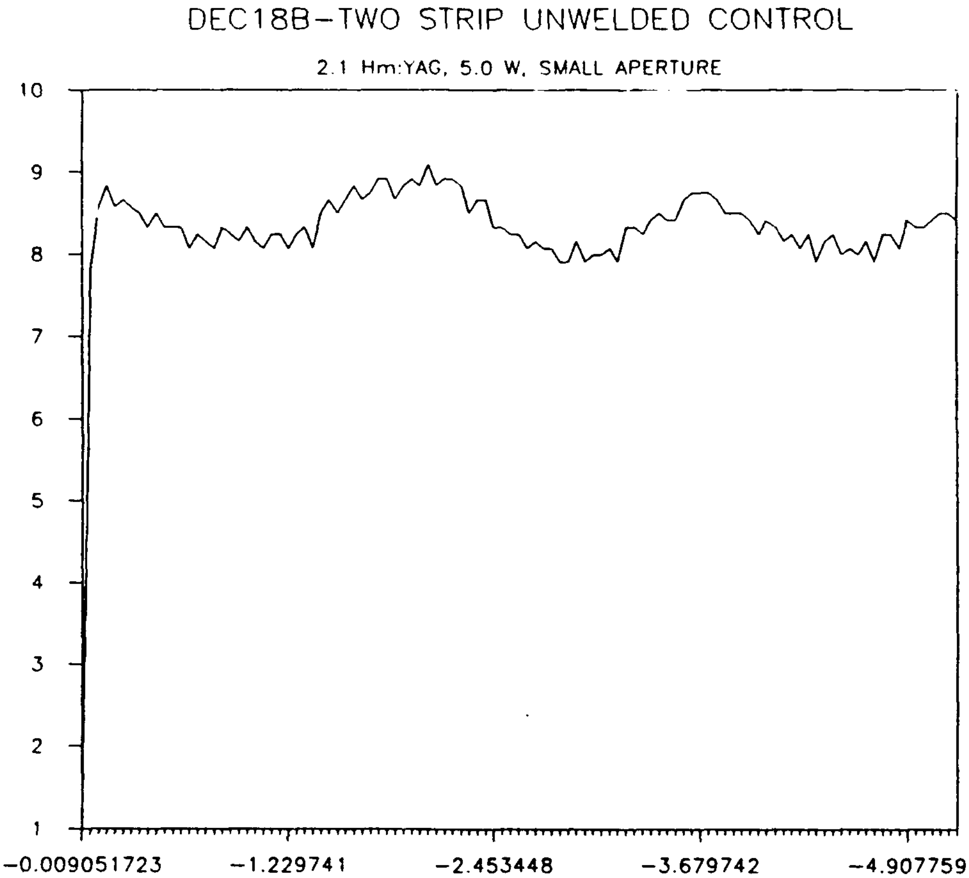


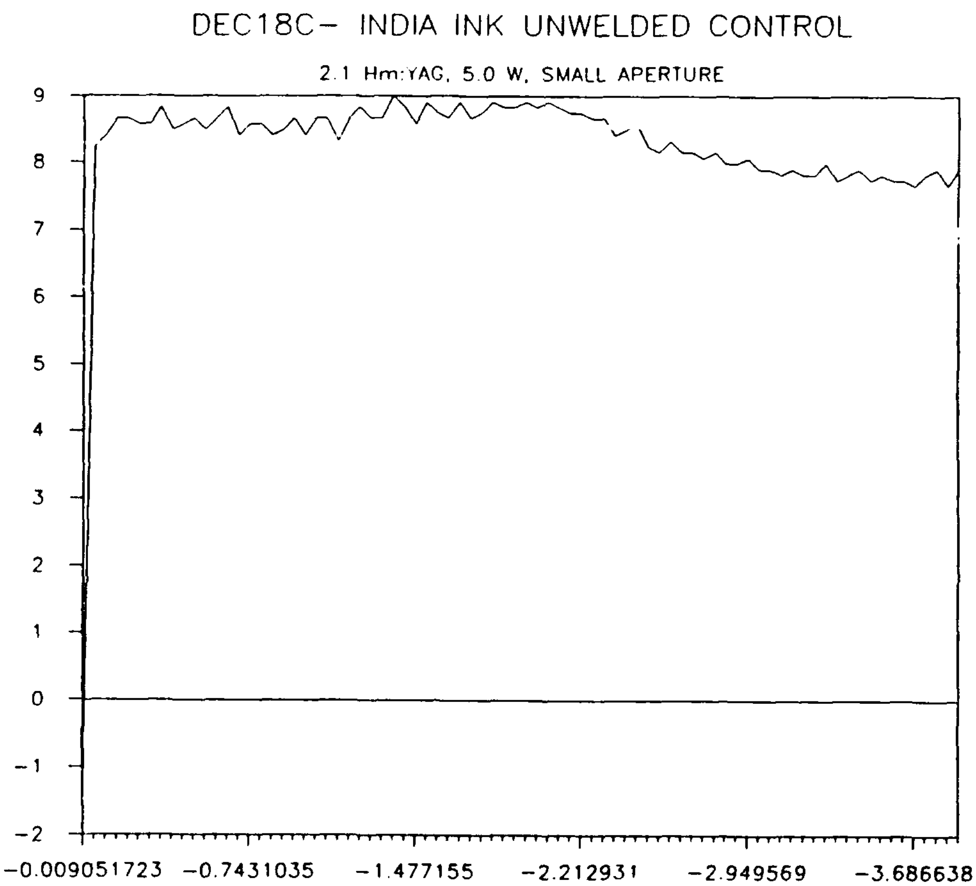
DEC17AC--BLOOD CONTROLLED AT 100, 10 s
2.1 Hm:YAG, 1.0 W, SMALL APERTURE
16
15
14
13
12
11
10
9
8
7
6
5
4
-0.01034483
-0.9637931
-1.918535
-2.876293
-3.873621
-4.792672

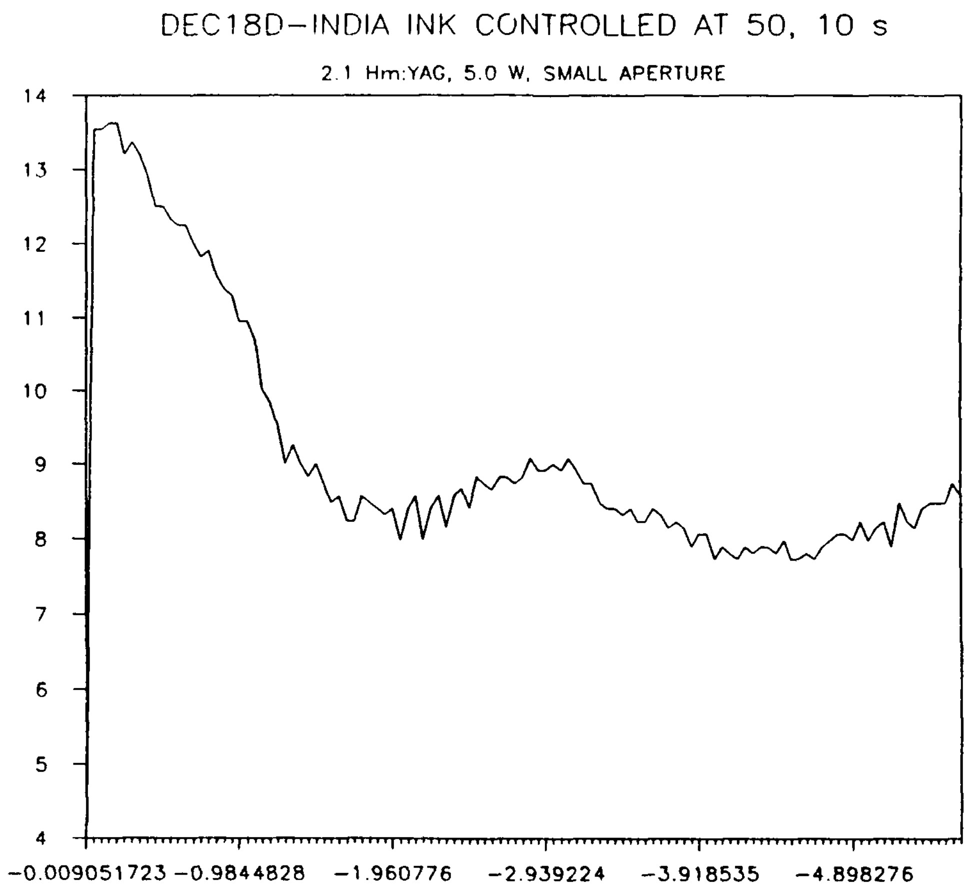
DEC18A– ONE STRIP UNWELDED CONTROL

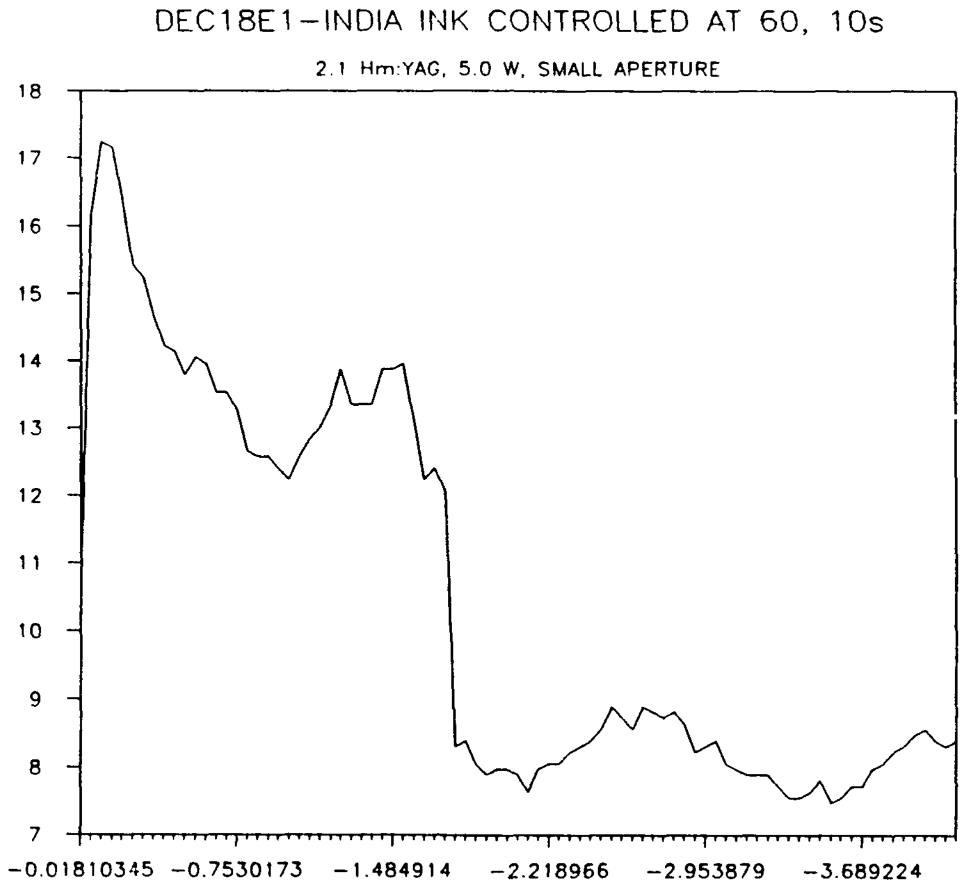
2.1 Hm:YAG, 5.0 W, SMALL APERTURE



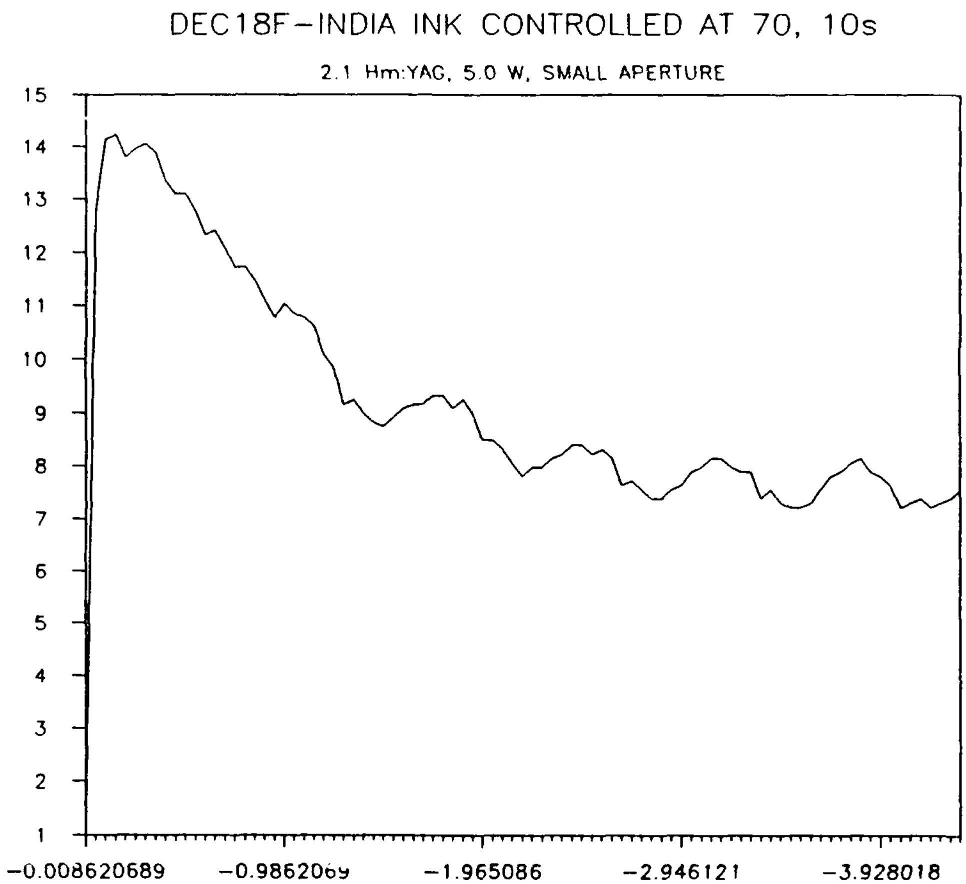

DEC18B-TWO STRIP UNWELDED CONTROL
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
10
9
8
7
6
5
4
3
2
1
-0.009051723
-1.229741
-2.453448
-3.679742
-4.907759


DEC18C– INDIA INK UNWELDED CONTROL
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
9
8
7
6
5
4
3
2
1
0
–1
–2
–0.009051723
–0.7431035
–1.477155
–2.212931
–2.949569
–3.686638


DEC18D-INDIA INK CONTROLLED AT 50, 10 s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
14
13
12
11
10
9
8
7
6
5
4
-0.009051723
-0.9844828
-1.960776
-2.939224
-3.918535
-4.898276



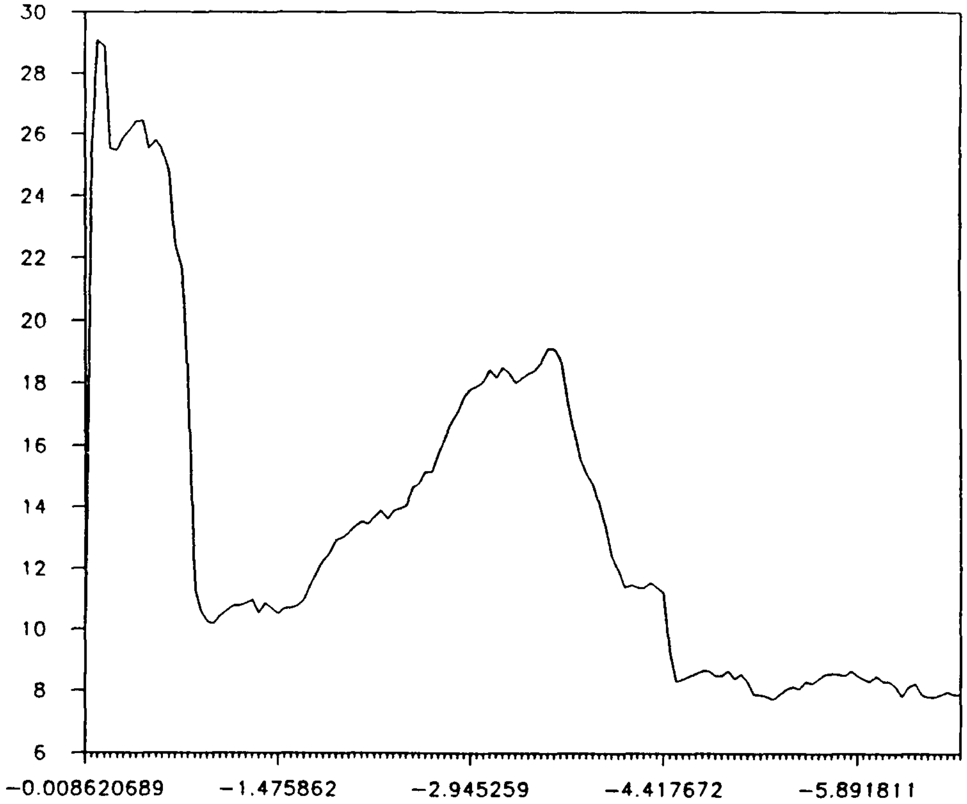
DEC18E1-INDIA INK CONTROLLED AT 60, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
18
17
16
15
14
13
12
11
10
9
8
7
-0.01810345
-0.7530173
-1.484914
-2.218966
-2.953879
-3.689224

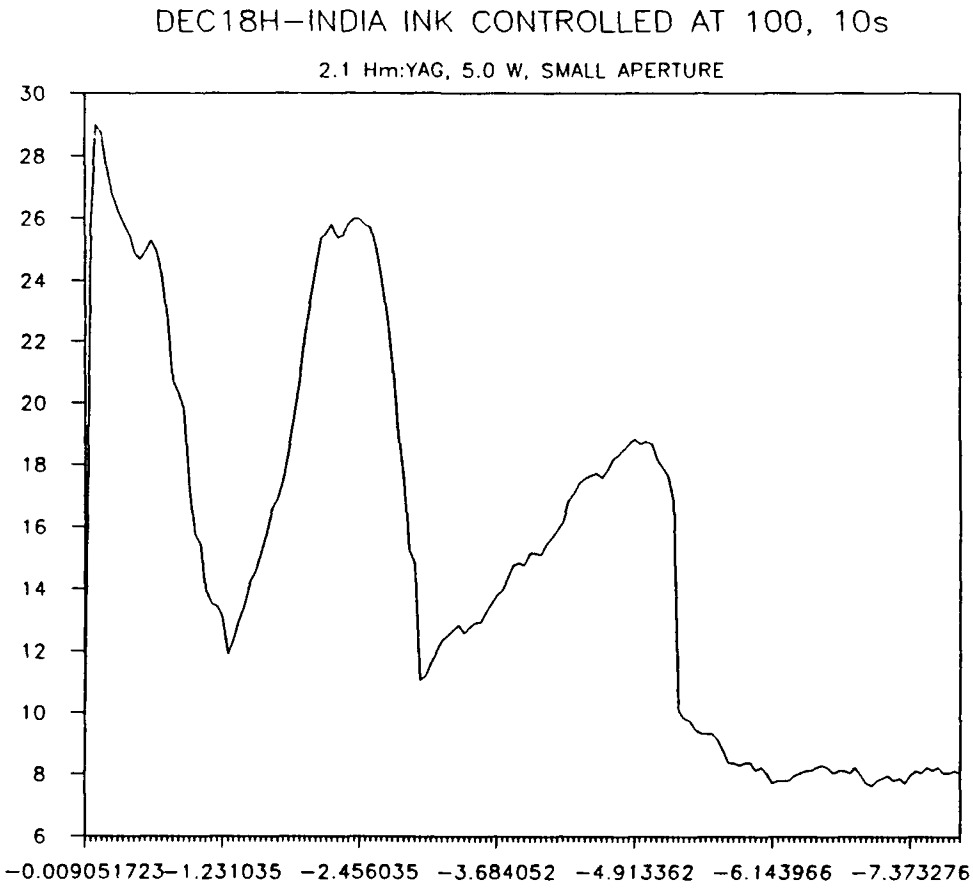


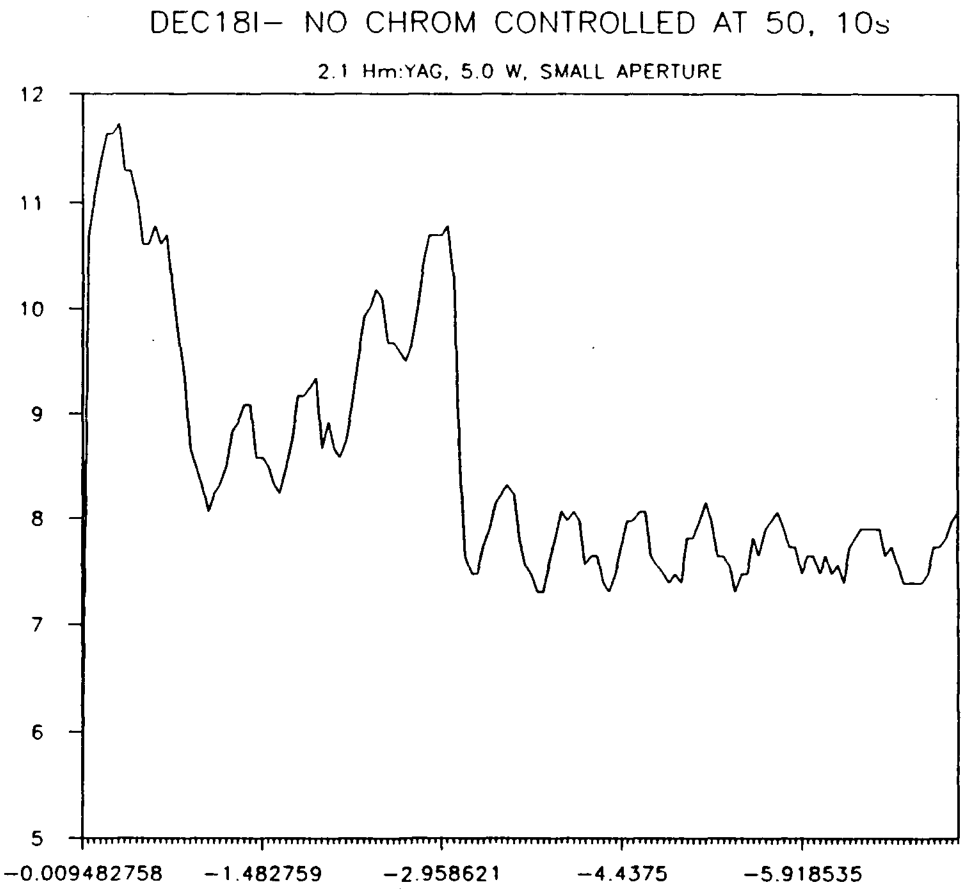
DEC18F-INDIA INK CONTROLLED AT 70, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
-0.008620689
-0.9862069
-1.965086
-2.946121
-3.928018

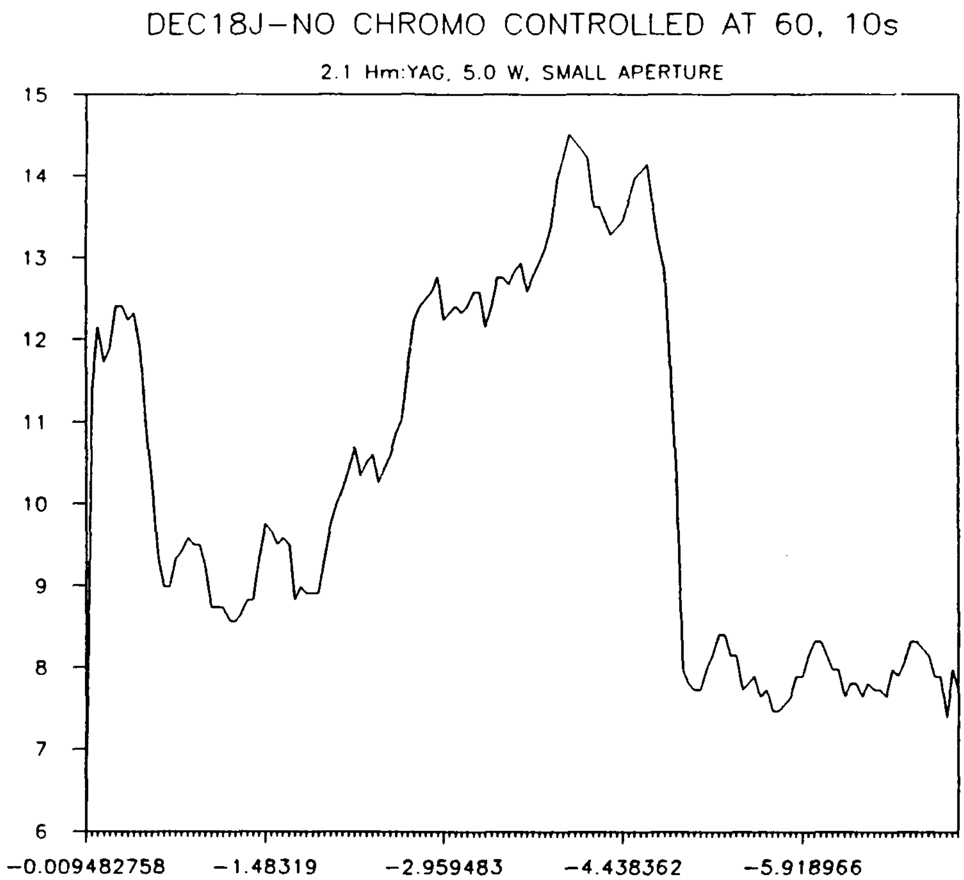
DEC18G– INDIA INK CONTROLLED AT 80, 10s

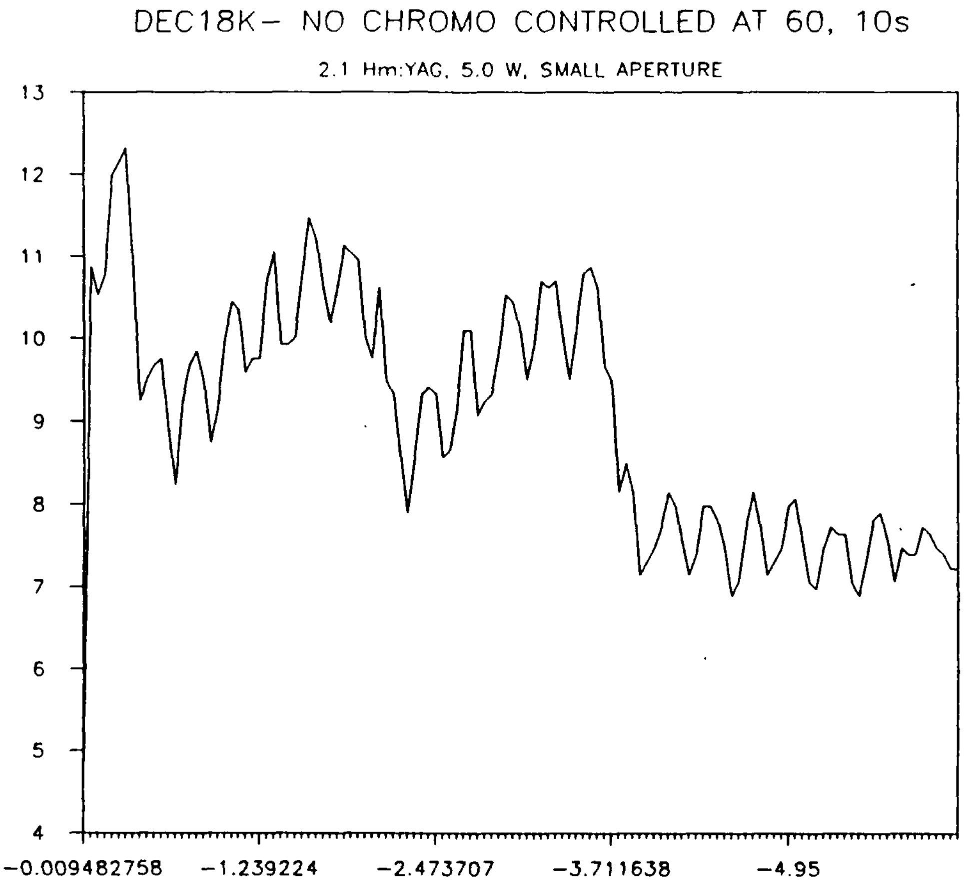
2.1 Hm:YAG, 5.0 W, SMALL APERTURE




DEC18H–INDIA INK CONTROLLED AT 100, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
30
28
26
24
22
20
18
16
14
12
10
8
6
–0.009051723
–1.231035
–2.456035
–3.684052
–4.913362
–6.143966
–7.373276

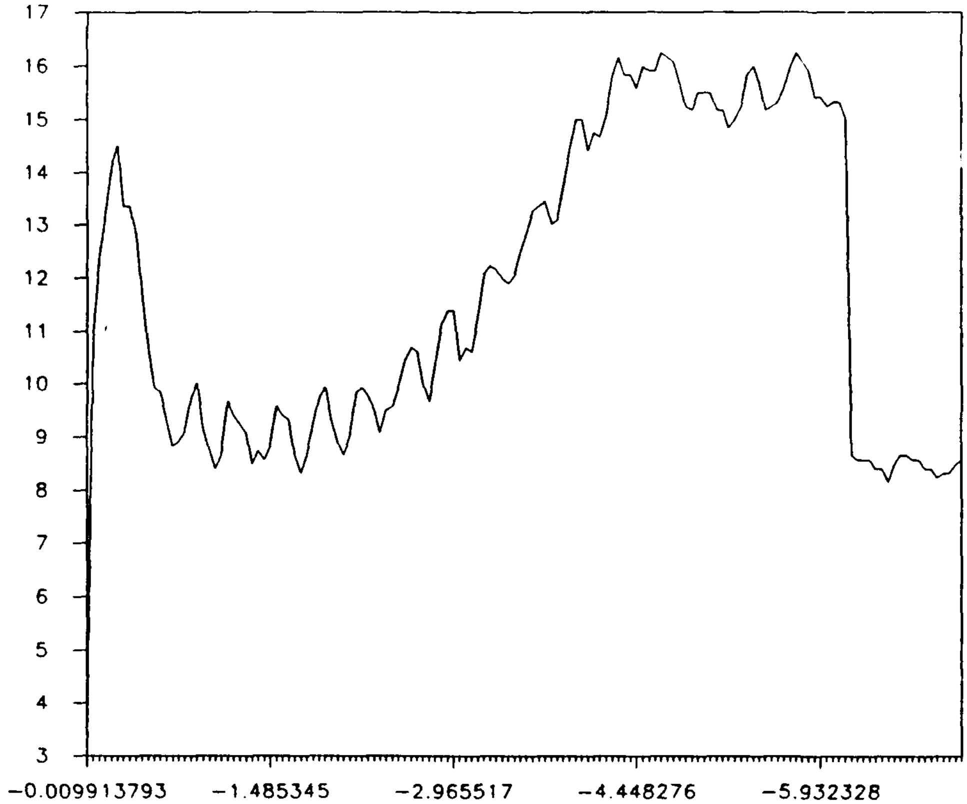

DEC18I– NO CHROM CONTROLLED AT 50, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
12
11
10
9
8
7
6
5
–0.009482758
–1.482759
–2.958621
–4.4375
–5.918535


DEC18J-NO CHROMO CONTROLLED AT 60, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
15
14
13
12
11
10
9
8
7
6
-0.009482758
-1.48319
-2.959483
-4.438362
-5.918966


DEC18K– NO CHROMO CONTROLLED AT 60, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
13
12
11
10
9
8
7
6
5
4
–0.009482758
–1.239224
–2.473707
–3.711638
–4.95

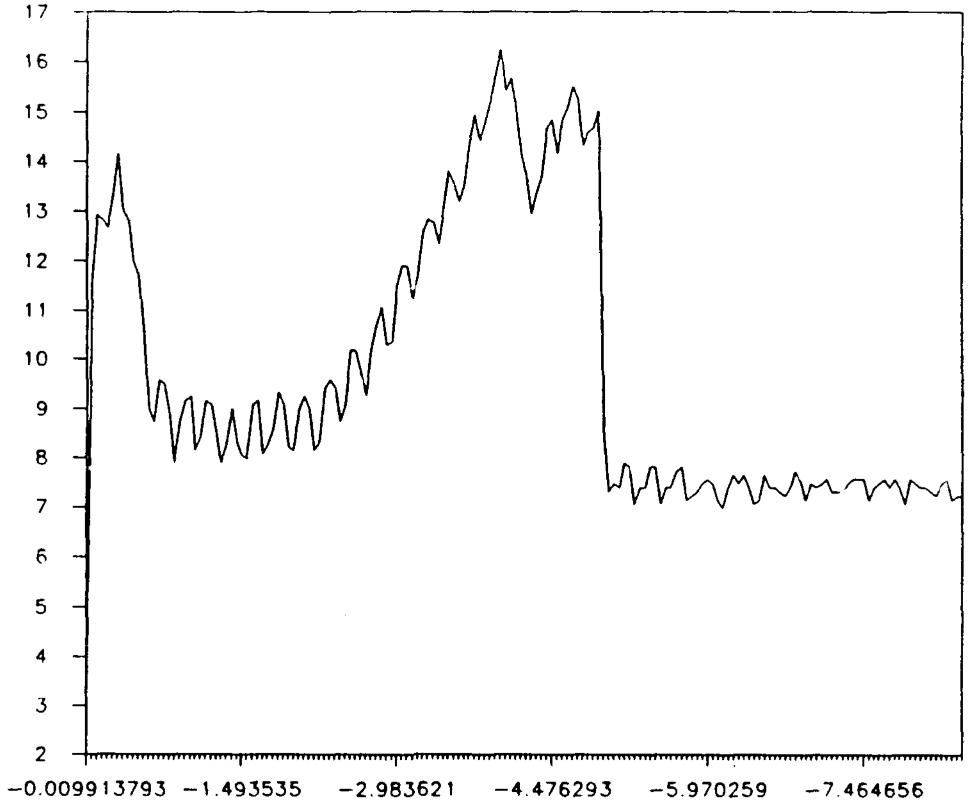
DEC18L-NO CHROMO CONTROLLED AT 70, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



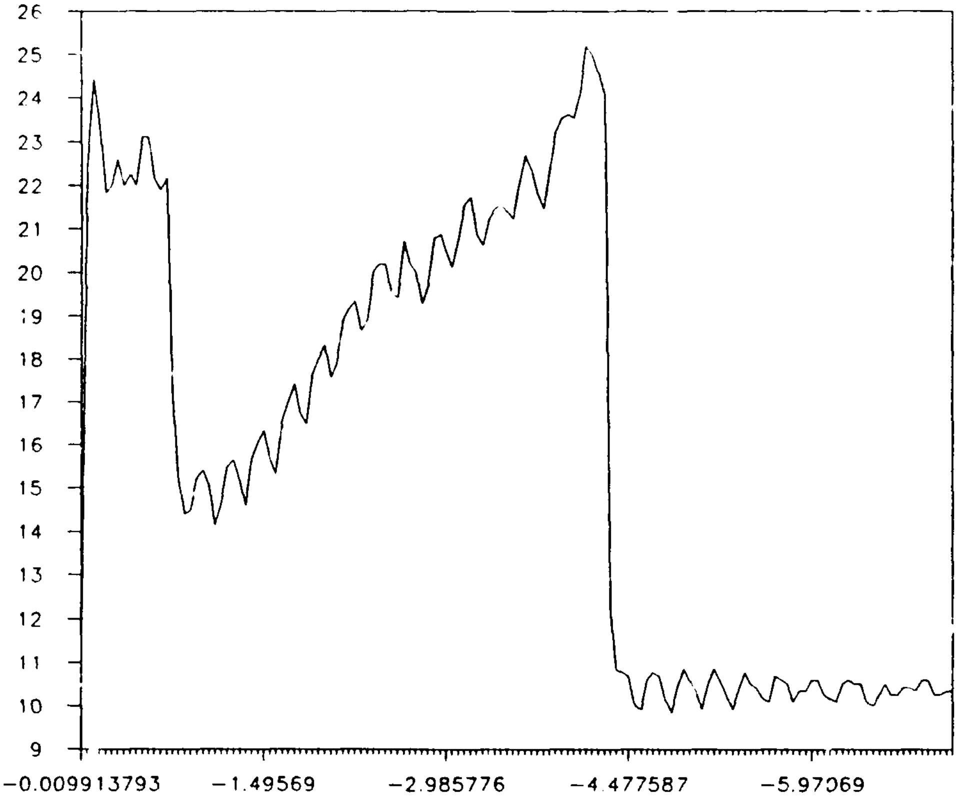
DEC18N-NO CHROMO-CONTROLLED AT 80, 10 s

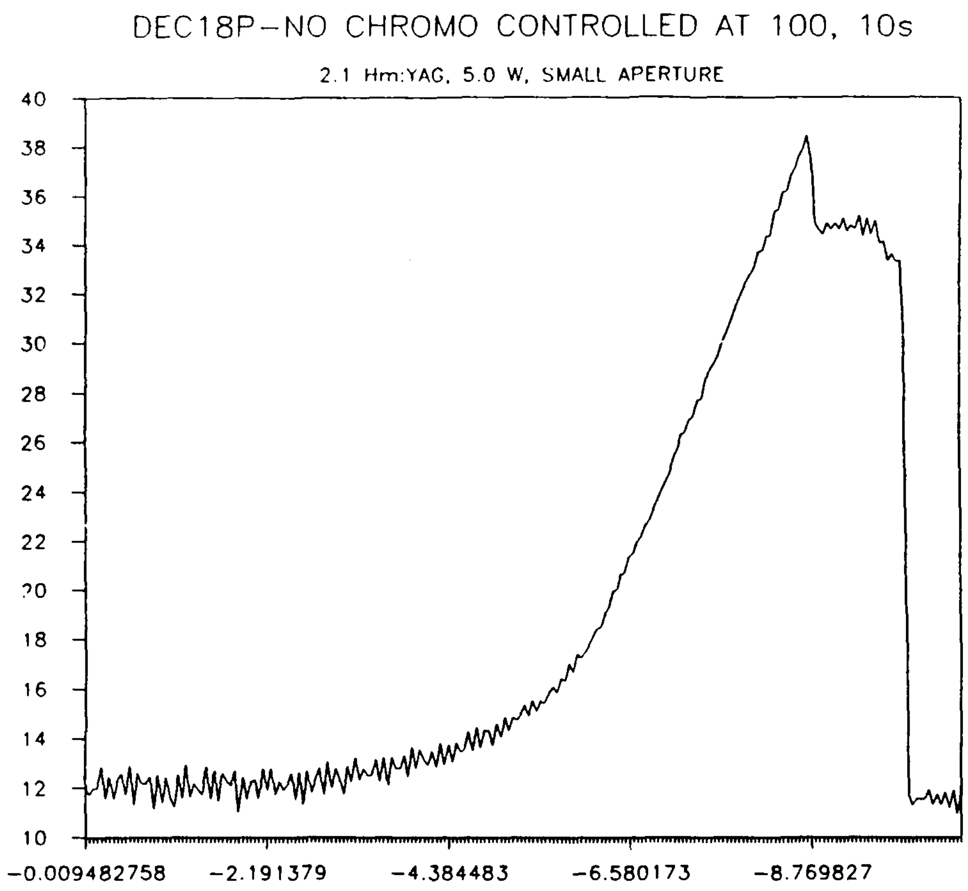
2.1 Hm:YAG, 5.0 W, SMALL APERTURE



DEC'80- NO CHROMO CONTROLLED AT 100,10s

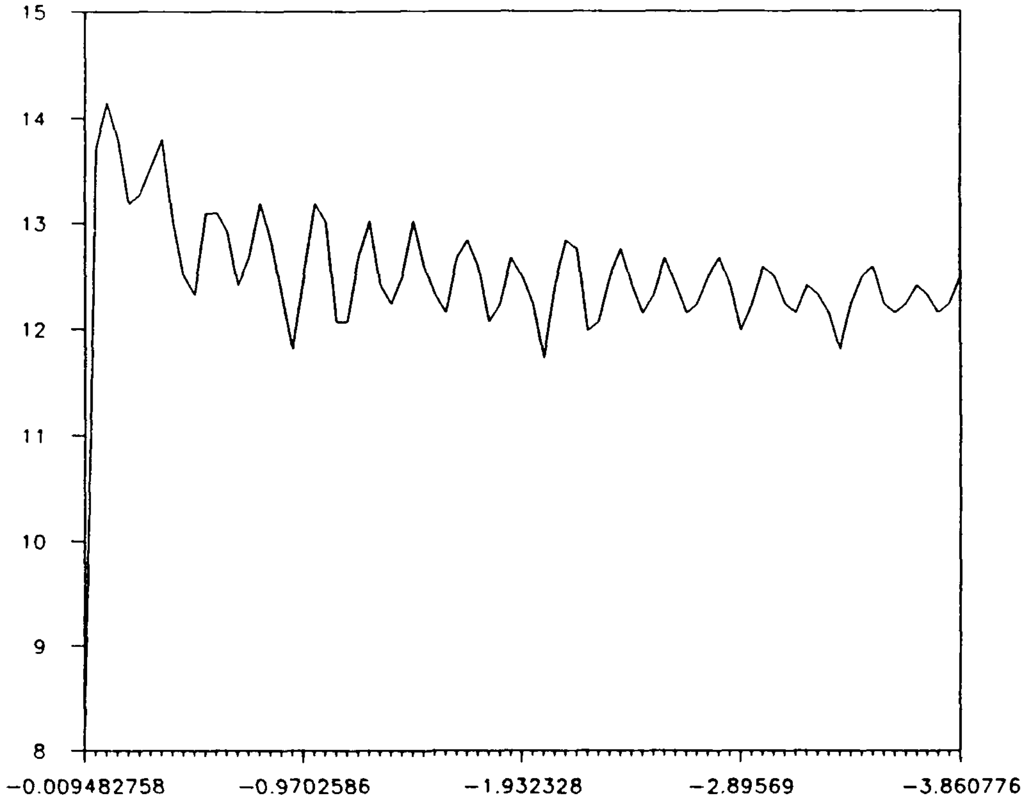
2.1 Hm:YAG, 5.0 W, SMALL APERTURE

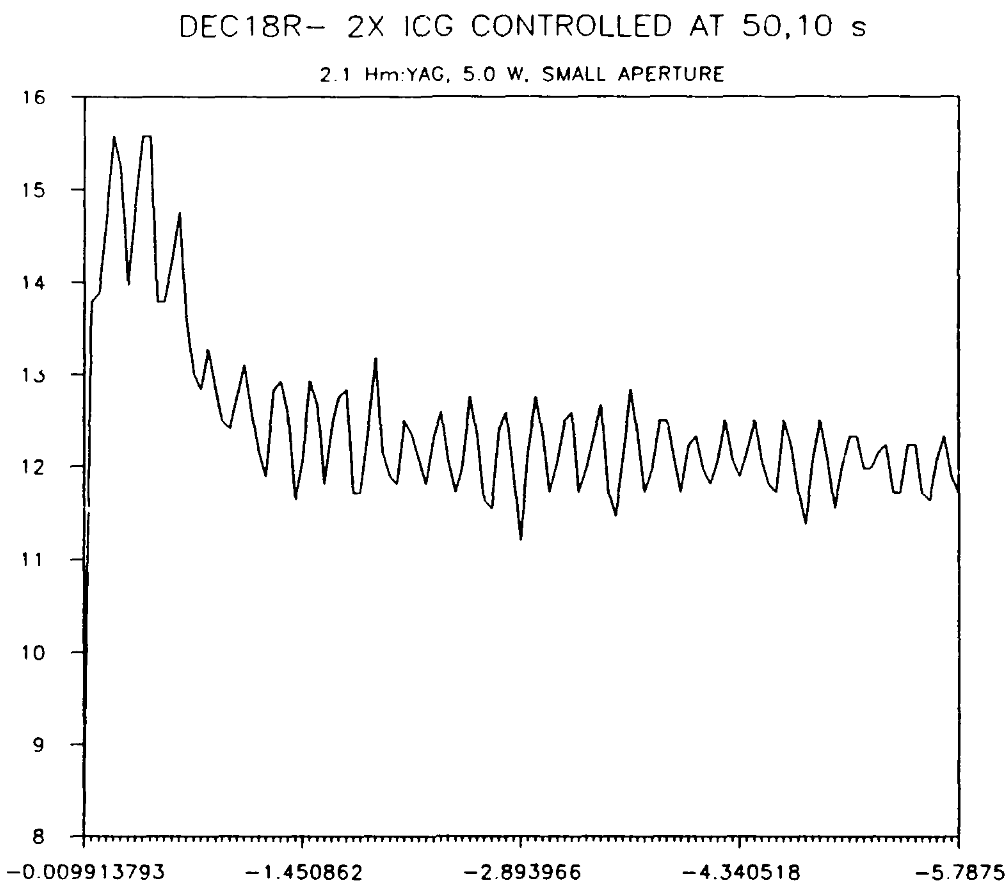


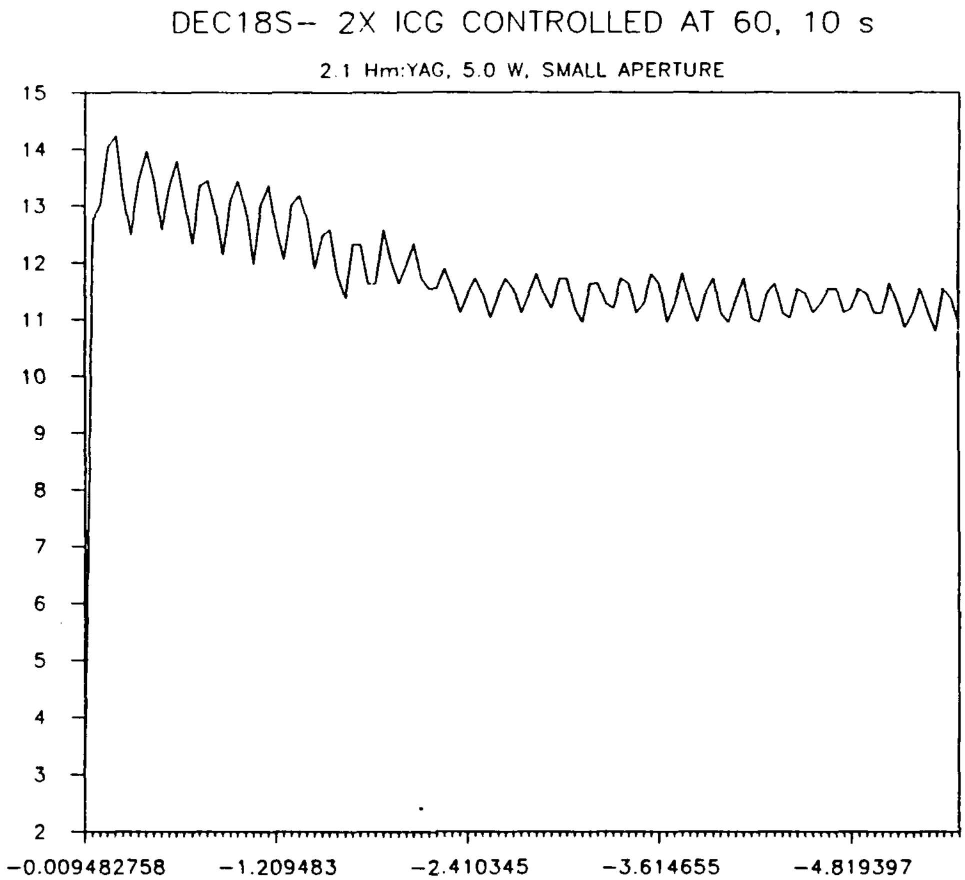

DEC18P-NO CHROMO CONTROLLED AT 100, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
-0.009482758
-2.191379
-4.384483
-6.580173
-8.769827

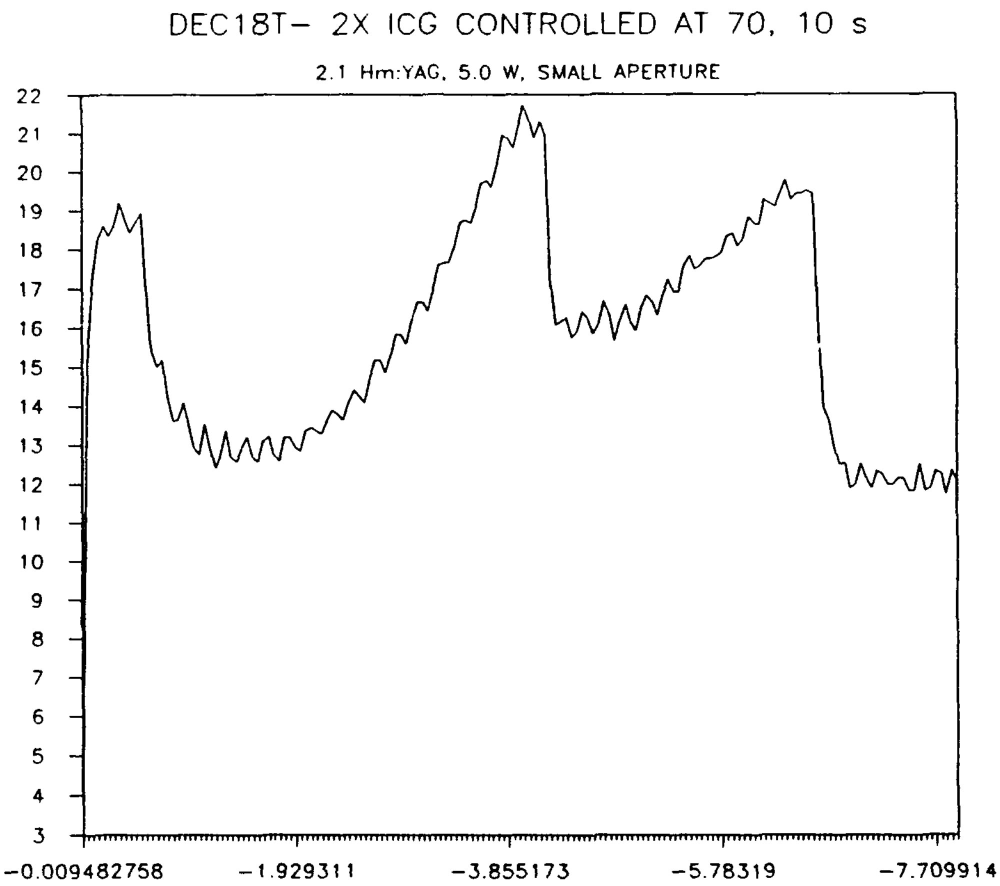
DEC18Q– 2X ICG UNWELDED CONTROL

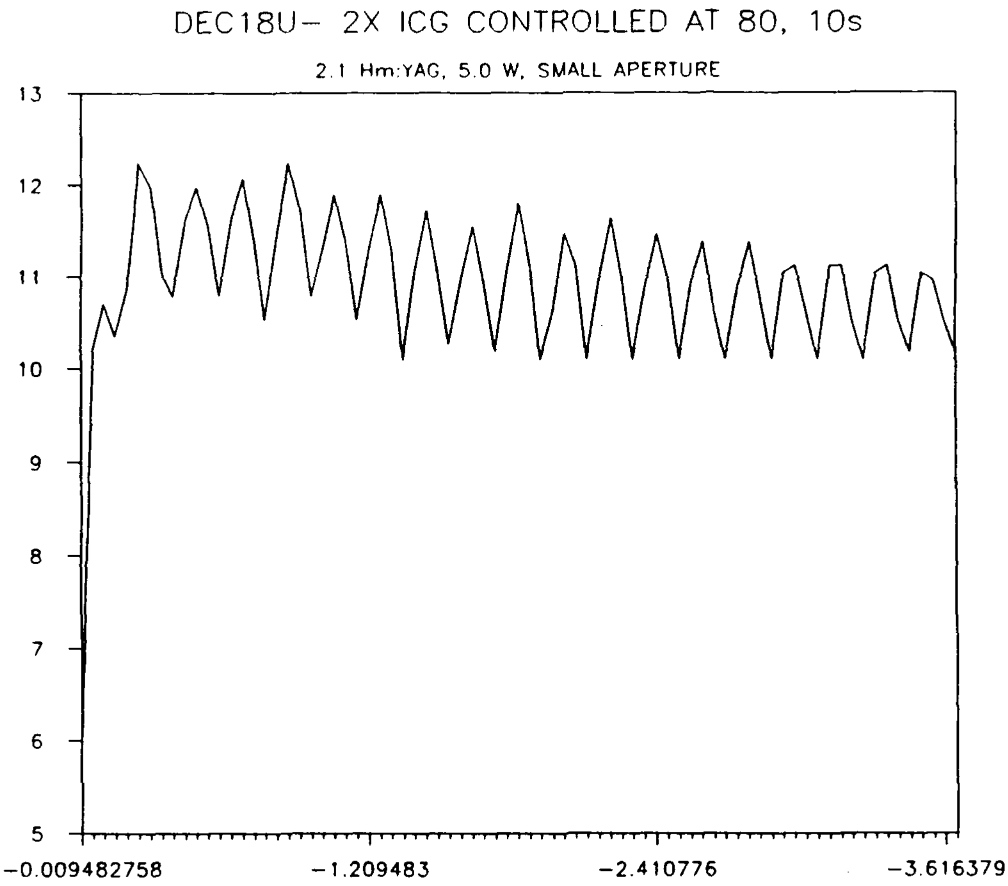
2.1 Hm:YAG, 5.0 W, SMALL APERTURE




DEC18R- 2X ICG CONTROLLED AT 50,10 s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
16
15
14
13
12
11
10
9
8
-0.009913793
-1.450862
-2.893966
-4.340518
-5.7875

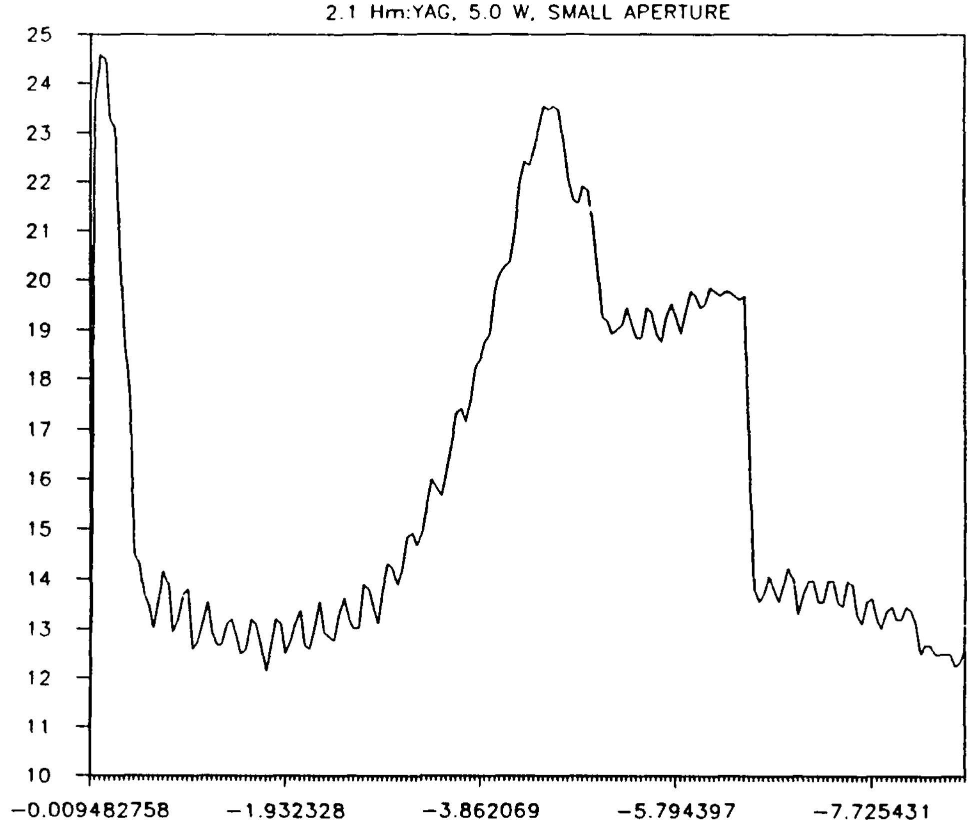

DEC18S-- 2X ICG CONTROLLED AT 60, 10 s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
15
14
13
12
11
10
9
8
7
6
5
4
3
2
-0.009482758
-1.209483
-2.410345
-3.614655
-4.819397

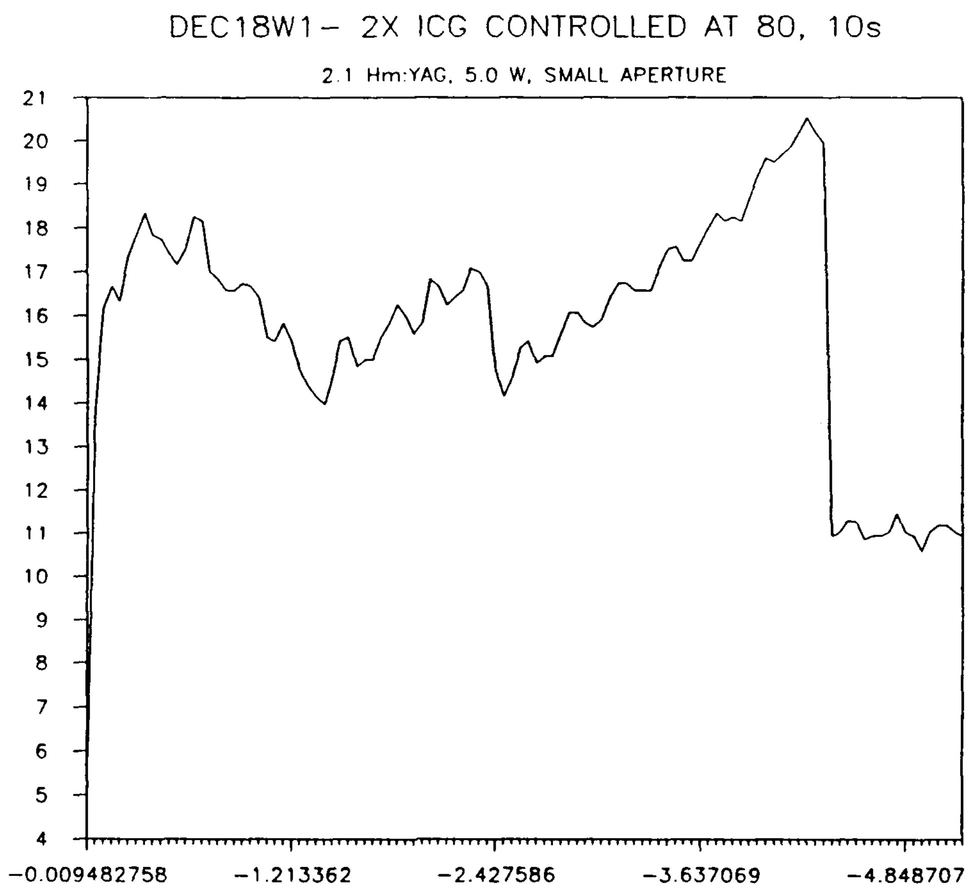

DEC18T- 2X ICG CONTROLLED AT 70, 10 s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
-0.009482758
-1.929311
-3.855173
-5.78319
-7.709914

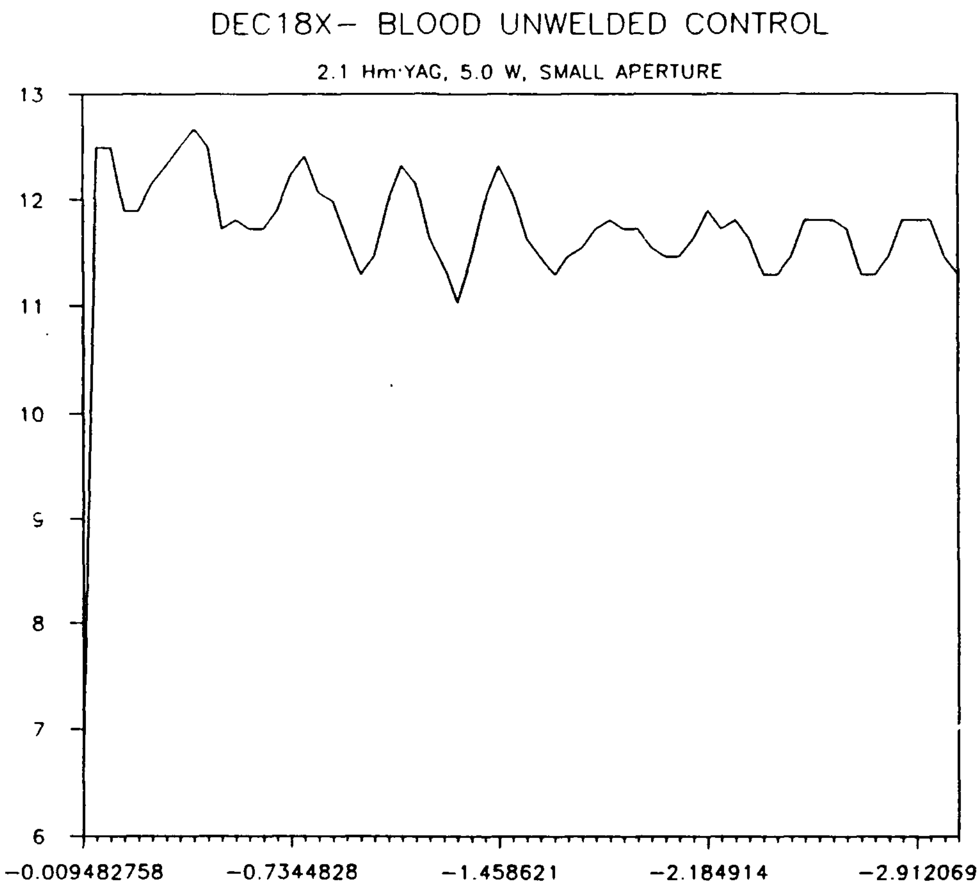

DEC18U– 2X ICG CONTROLLED AT 80, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
13
12
11
10
9
8
7
6
5
–0.009482758
–1.209483
–2.410776
–3.616379

DEC18V- 2X CIG CONTROLLED AT 100, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE

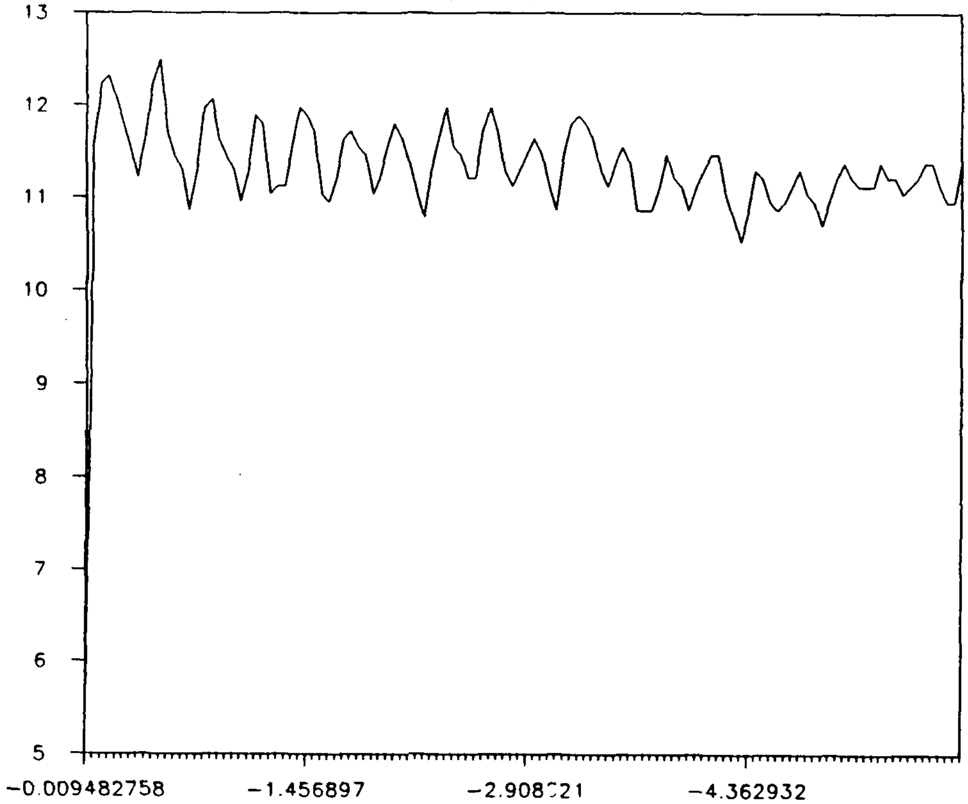


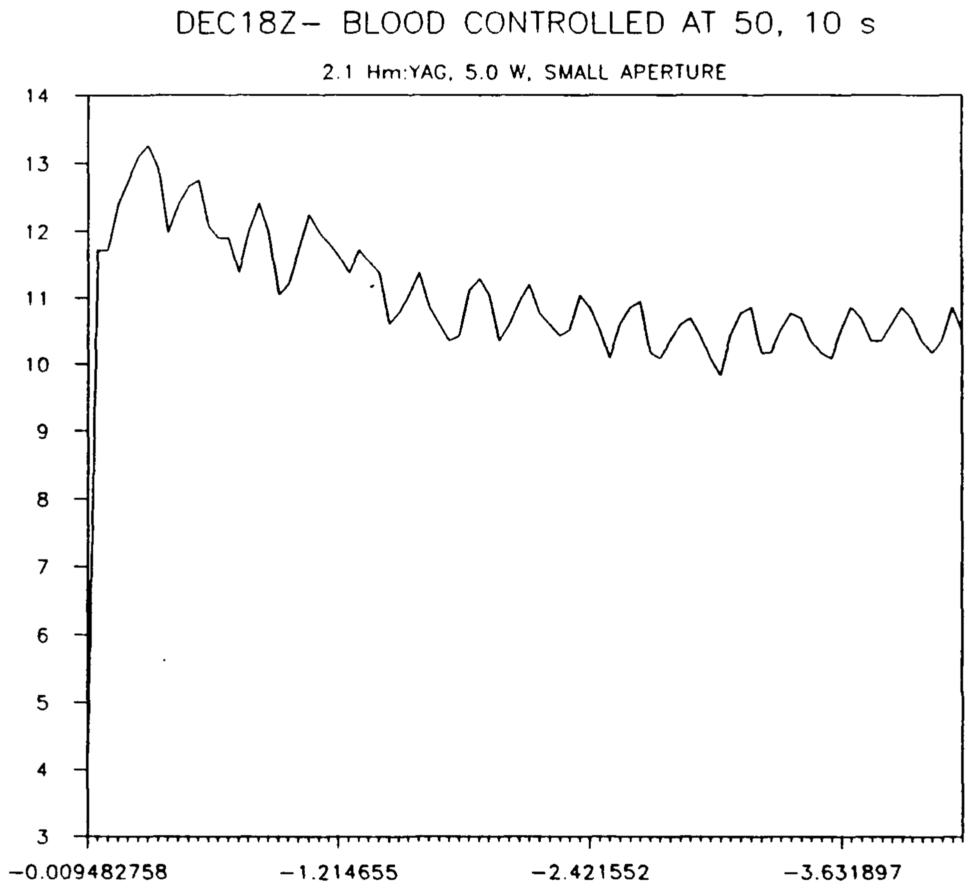

DEC18W1- 2X ICG CONTROLLED AT 80, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
-0.009482758
-1.213362
-2.427586
-3.637069
-4.848707


DEC18X– BLOOD UNWELDED CONTROL
2.1 Hm·YAG, 5.0 W, SMALL APERTURE
13
12
11
10
9
8
7
6
–0.009482758
–0.7344828
–1.458621
–2.184914
–2.912069

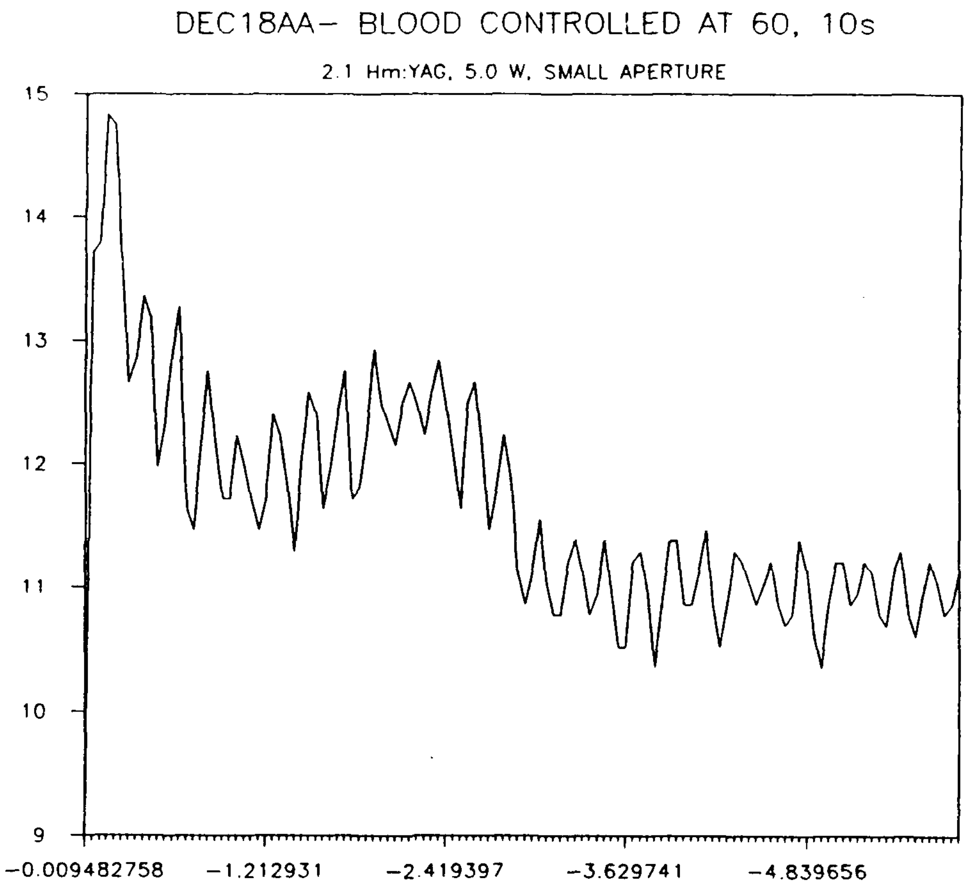
DEC18Y– BLOOD CONTROLLED AT 50, 10 s

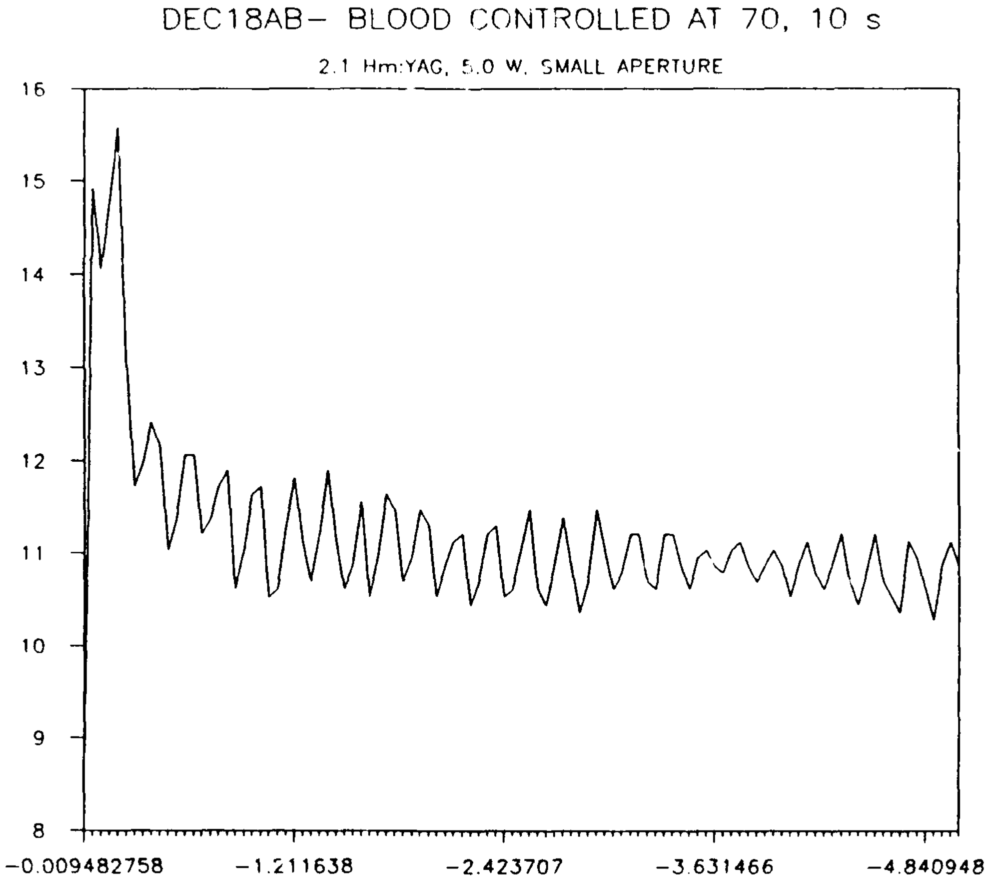
2.1 Hm:YAG, 5.0 W, SMALL APERTURE

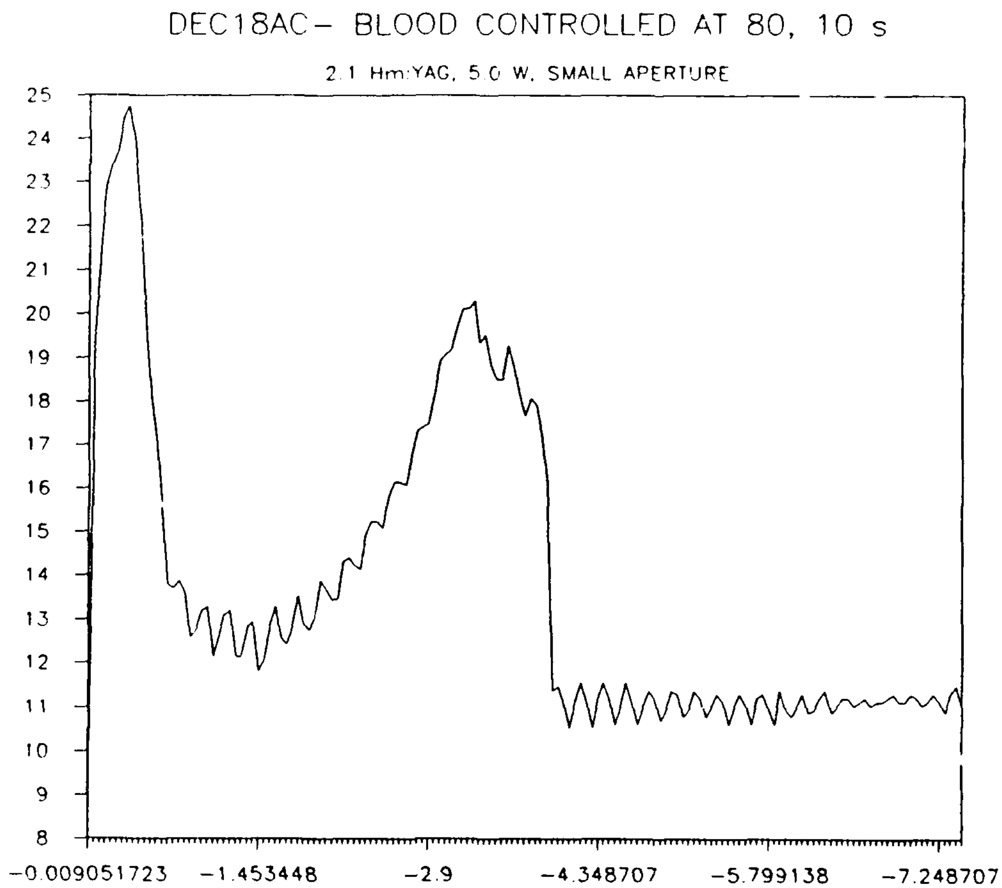


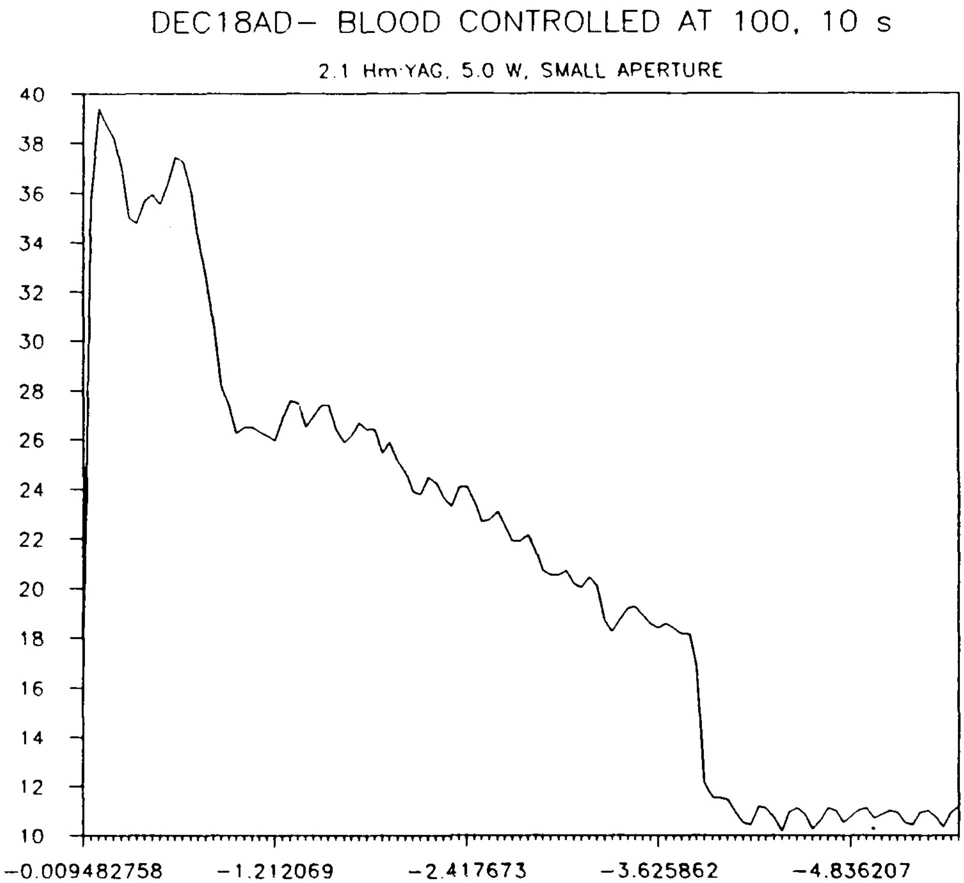


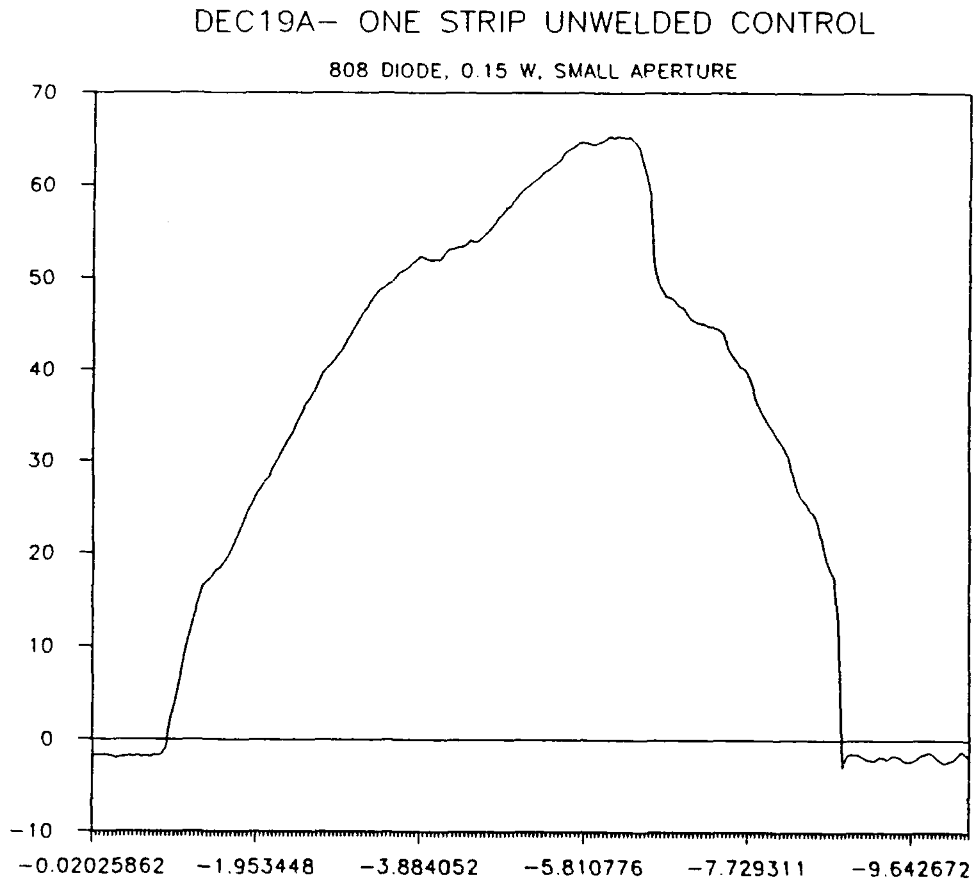
DEC18Z- BLOOD CONTROLLED AT 50, 10 s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
14
13
12
11
10
9
8
7
6
5
4
3
-0.009482758
-1.214655
-2.421552
-3.631897

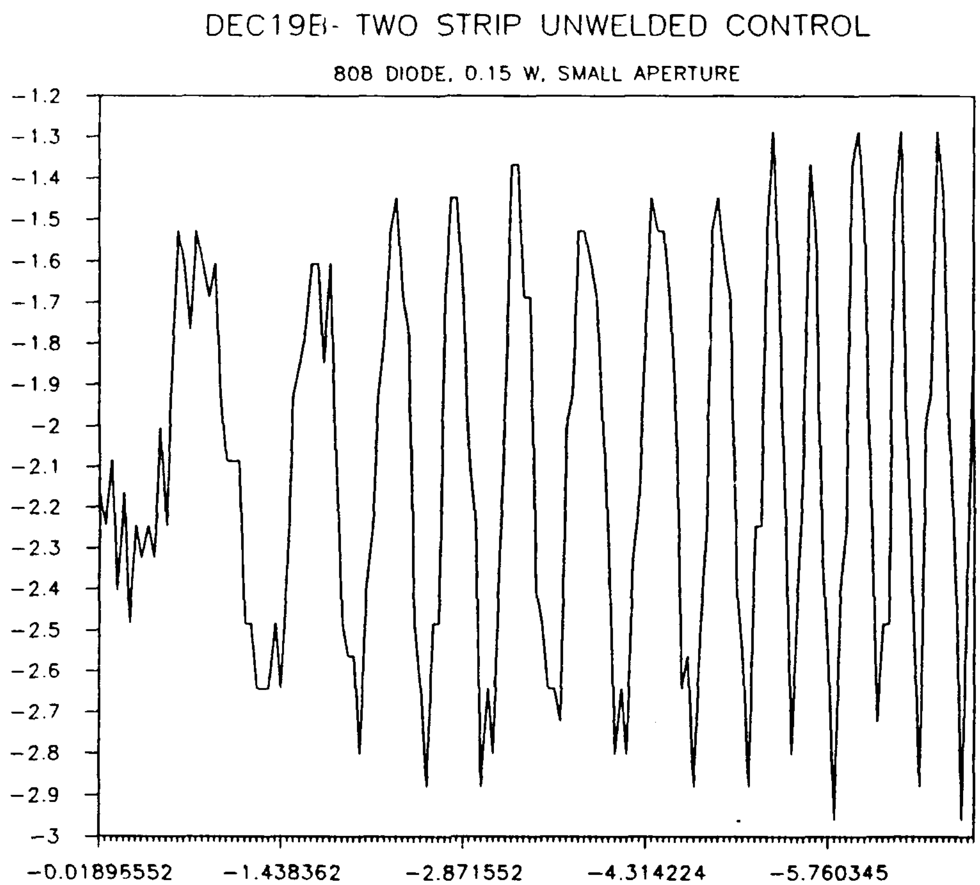

DEC18AA– BLOOD CONTROLLED AT 60, 10s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
15
14
13
12
11
10
9
–0.009482758
–1.212931
–2.419397
–3.629741
–4.839656

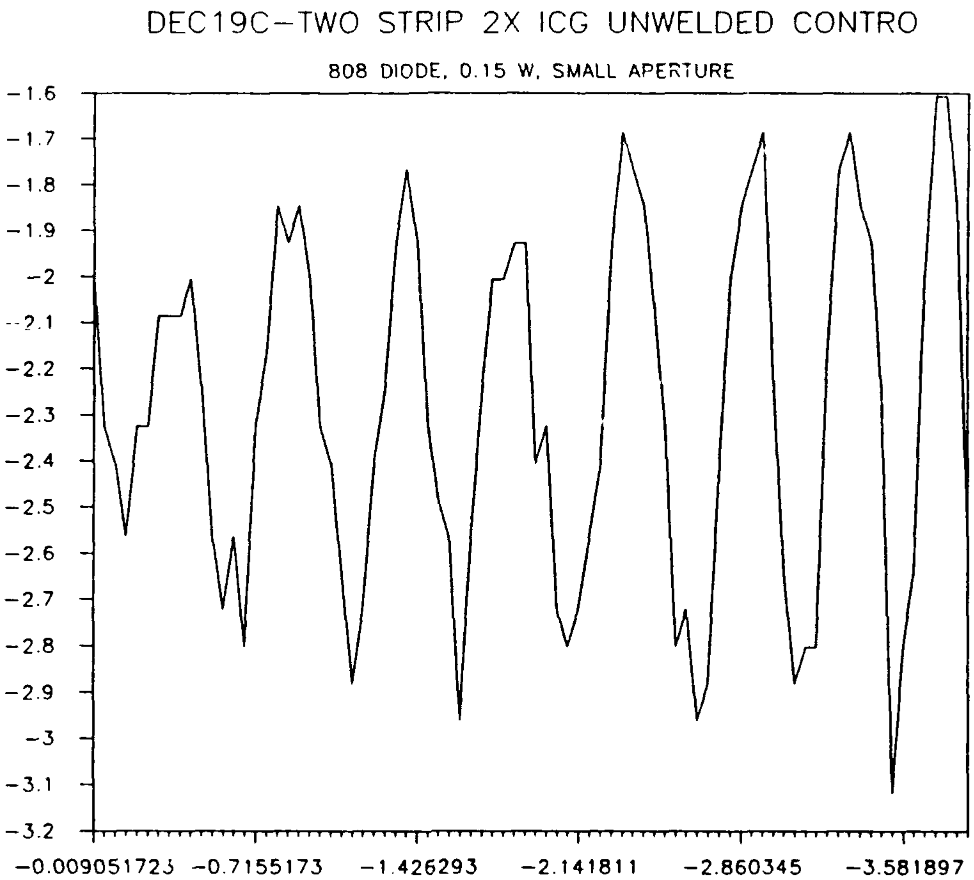

DEC18AB– BLOOD CONTROLLED AT 70, 10 s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
16
15
14
13
12
11
10
9
8
–0.009482758
–1.211638
–2.423707
–3.631466
–4.840948

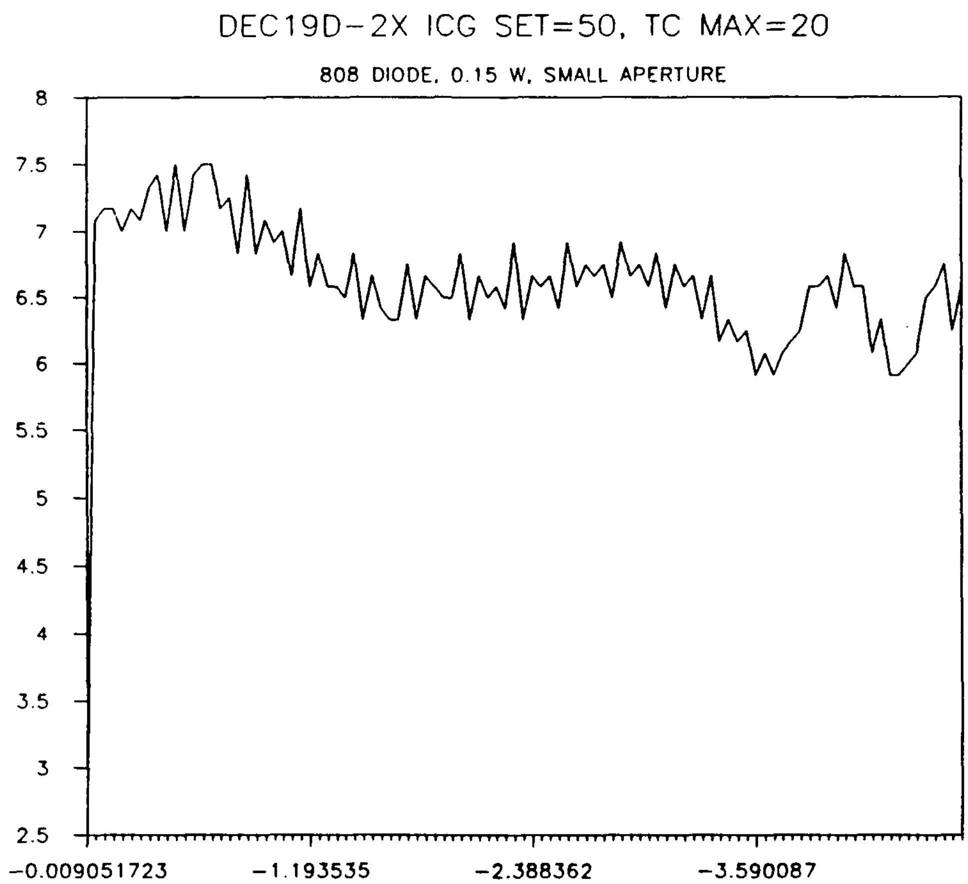

DEC18AC- BLOOD CONTROLLED AT 80, 10 s
2.1 Hm:YAG, 5.0 W, SMALL APERTURE
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
-0.009051723
-1.453448
-2.9
-4.348707
-5.799138
-7.248707


DEC18AD– BLOOD CONTROLLED AT 100, 10 s
2.1 Hm·YAG, 5.0 W, SMALL APERTURE
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
–0.009482758
–1.212069
–2.417673
–3.625862
–4.836207

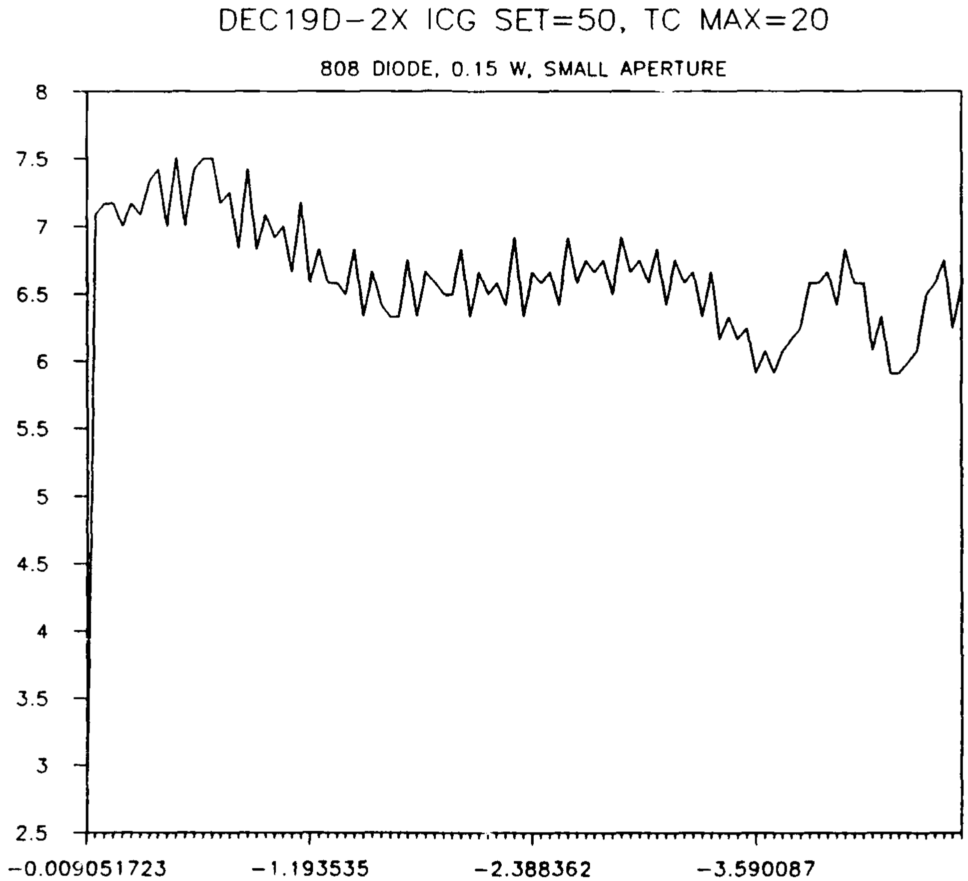

DEC19A- ONE STRIP UNWELDED CONTROL
808 DIODE, 0.15 W, SMALL APERTURE
70
60
50
40
30
20
10
0
-10
-0.02025862
-1.953448
-3.884052
-5.810776
-7.729311
-9.642672

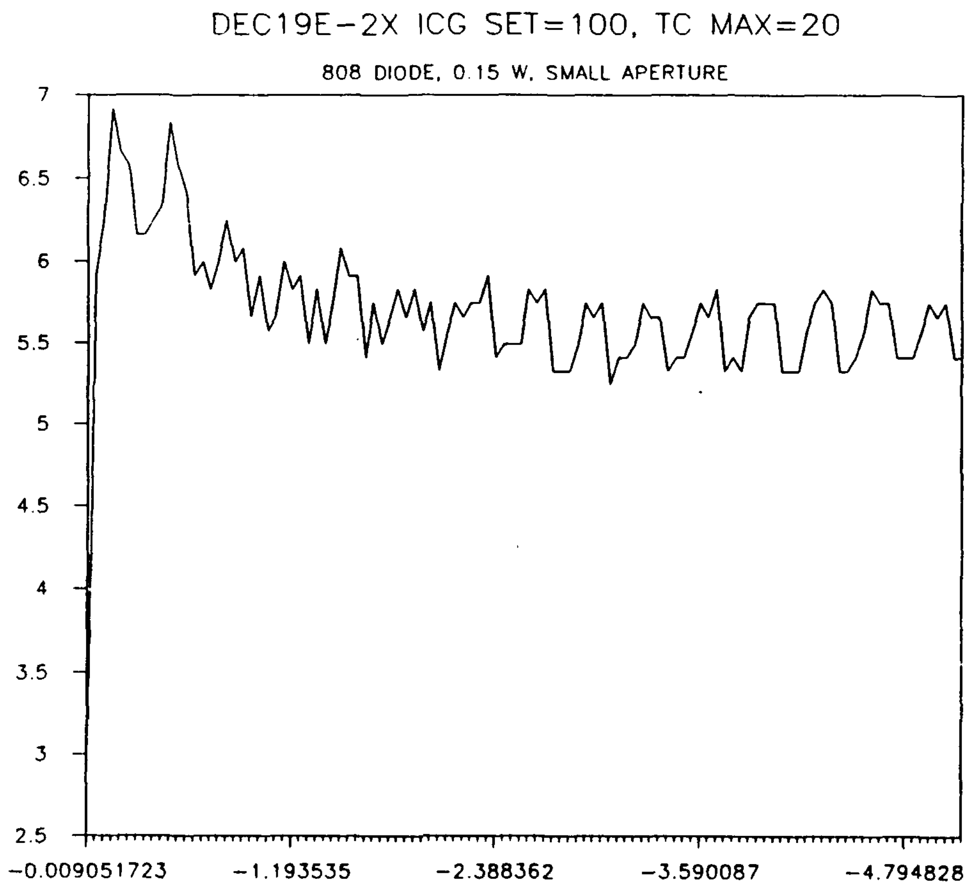

DEC19B- TWO STRIP UNWELDED CONTROL
808 DIODE, 0.15 W, SMALL APERTURE
-1.2
-1.3
-1.4
-1.5
-1.6
-1.7
-1.8
-1.9
-2
-2.1
-2.2
-2.3
-2.4
-2.5
-2.6
-2.7
-2.8
-2.9
-3
-0.01895552
-1.438362
-2.871552
-4.314224
-5.760345


DEC19C–TWO STRIP 2X ICG UNWELDED CONTRO
808 DIODE, 0.15 W, SMALL APERTURE
−1.6
−1.7
−1.8
−1.9
−2
−2.1
−2.2
−2.3
−2.4
−2.5
−2.6
−2.7
−2.8
−2.9
−3
−3.1
−3.2
−0.009051723
−0.7155173
−1.426293
−2.141811
−2.860345
−3.581897

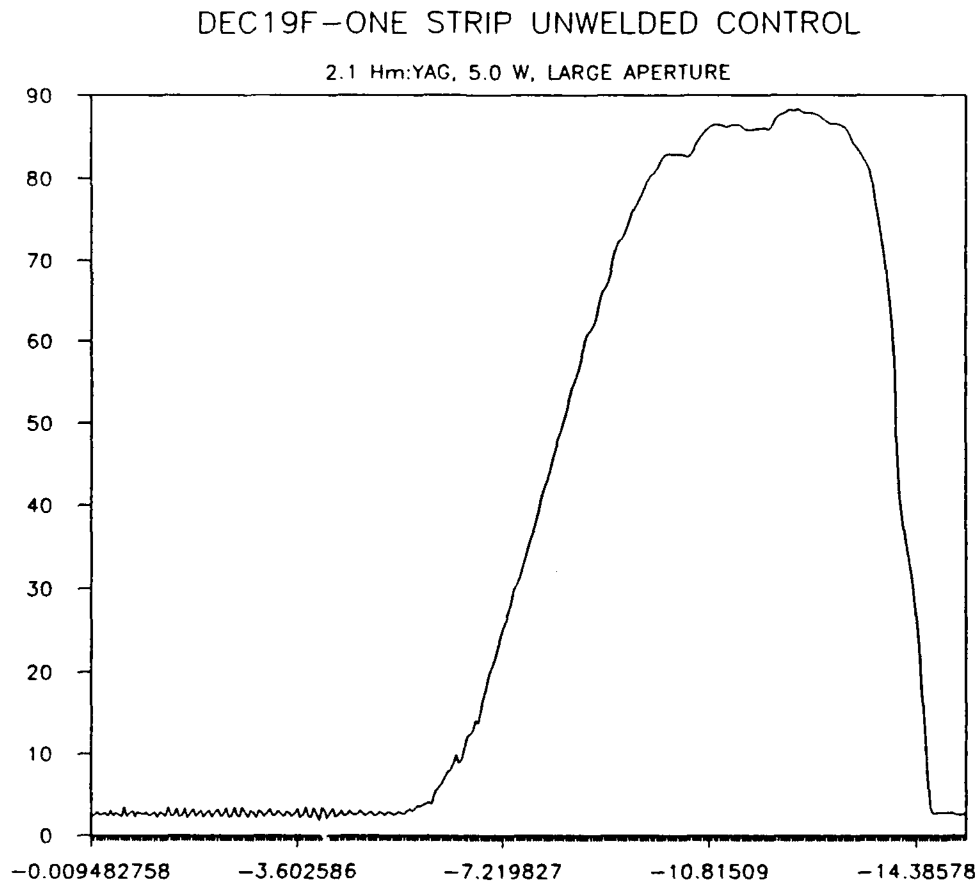


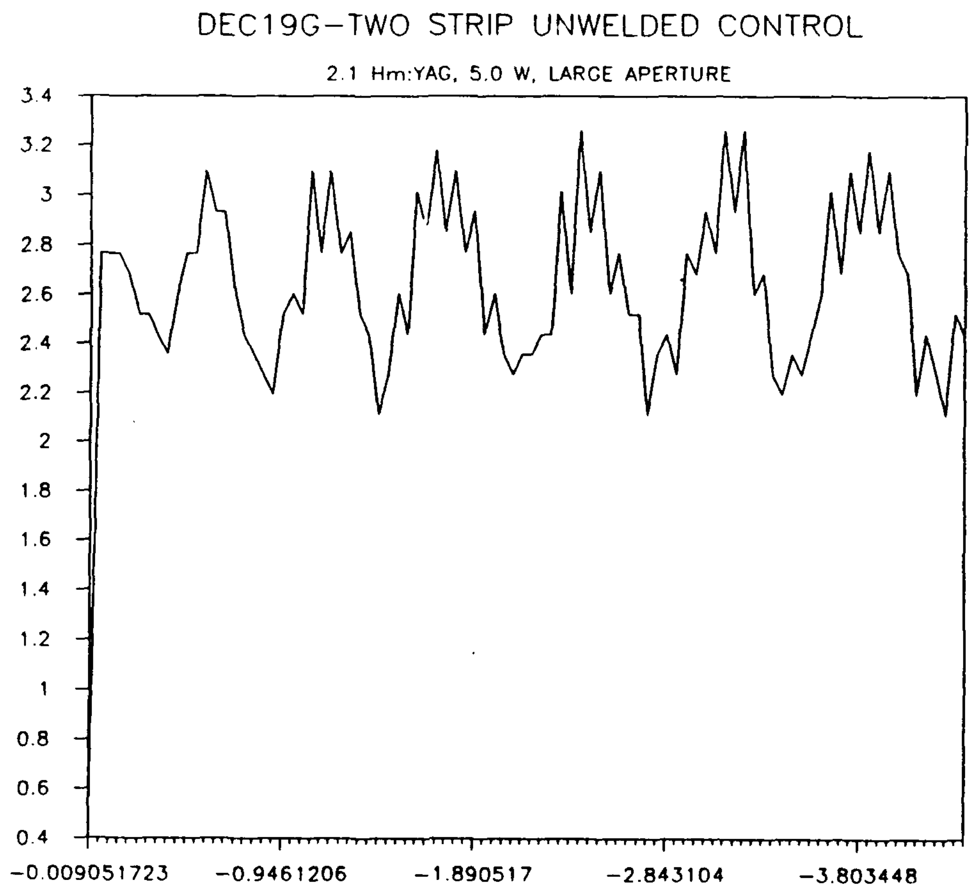
DEC19D-2X ICG SET=50, TC MAX=20
808 DIODE, 0.15 W, SMALL APERTURE
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
-0.009051723
-1.193535
-2.388362
-3.590087

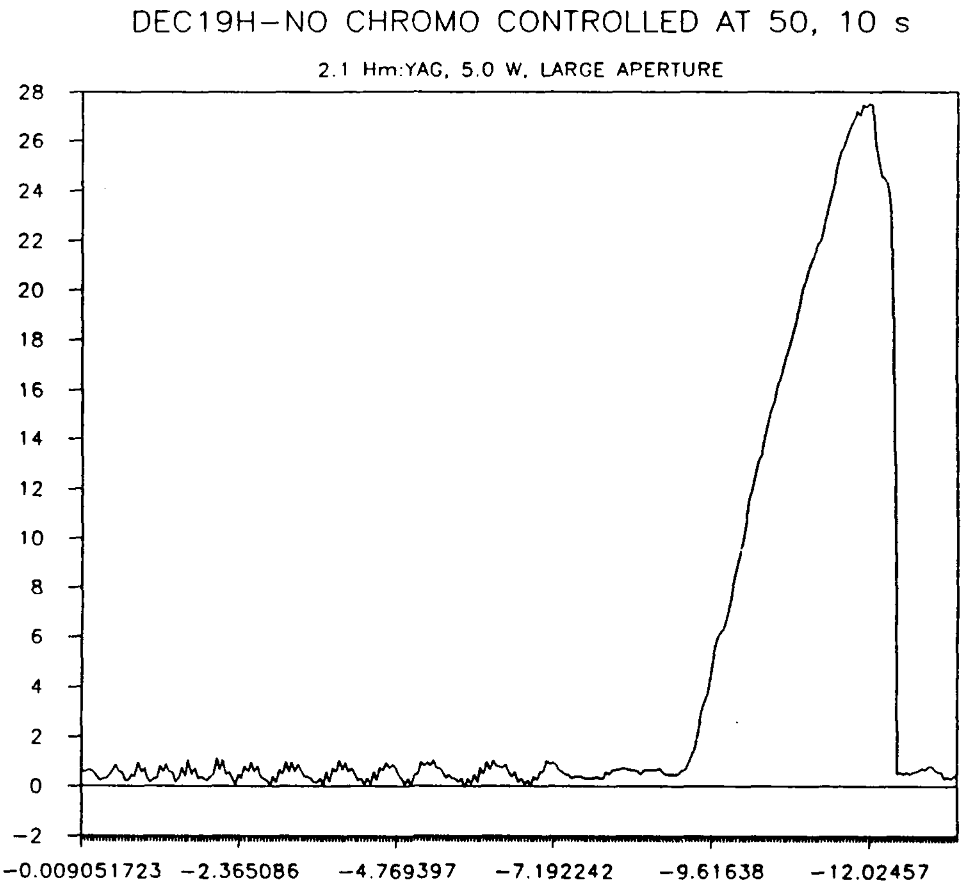

DEC19D-2X ICG SET=50, TC MAX=20
808 DIODE, 0.15 W, SMALL APERTURE
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
-0.009051723
-1.193535
-2.388362
-3.590087

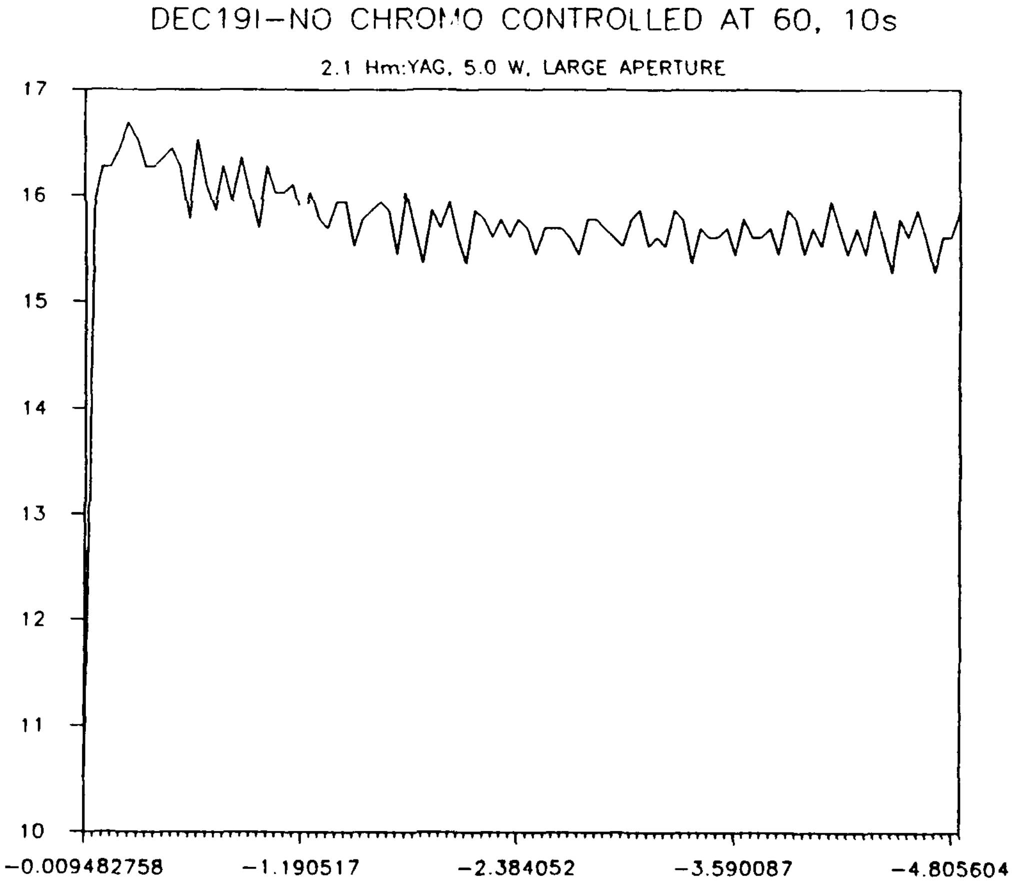


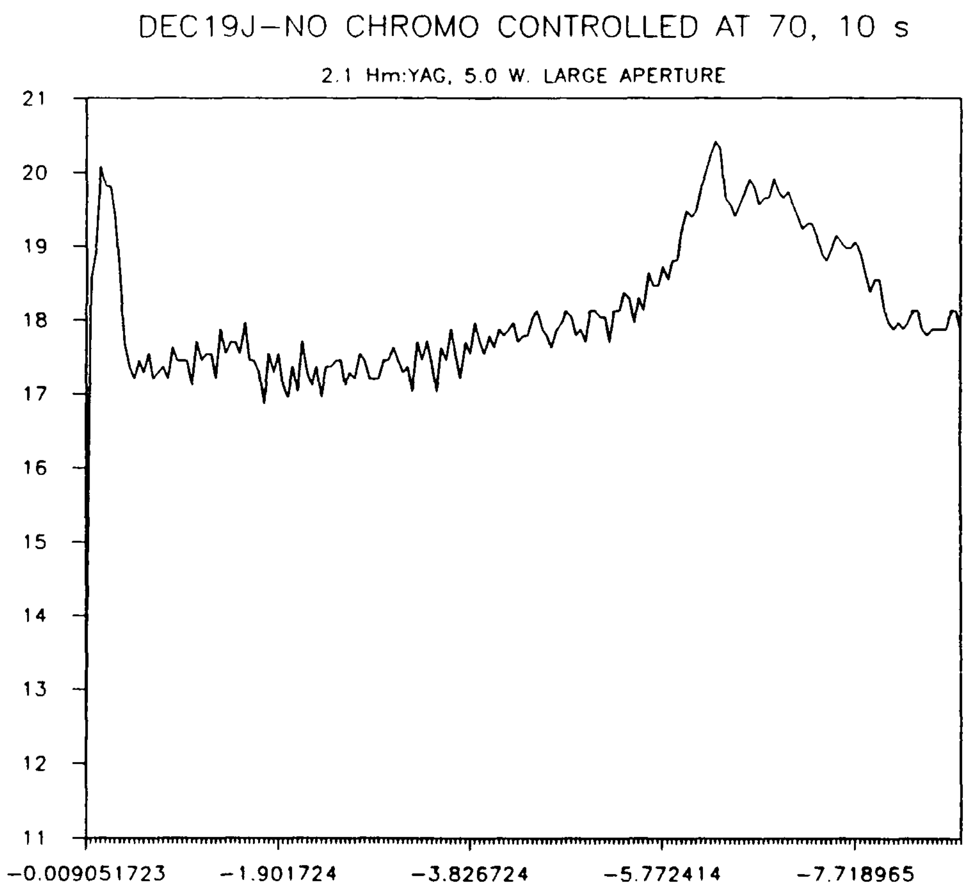
DEC19E-2X ICG SET=100, TC MAX=20
808 DIODE, 0.15 W, SMALL APERTURE
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
-0.009051723
-1.193535
-2.388362
-3.590087
-4.794828


DEC19F-ONE STRIP UNWELDED CONTROL
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
90
80
70
60
50
40
30
20
10
0
-0.009482758
-3.602586
-7.219827
-10.81509
-14.38578


DEC19G-TWO STRIP UNWELDED CONTROL
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
-0.009051723
-0.9461206
-1.890517
-2.843104
-3.803448

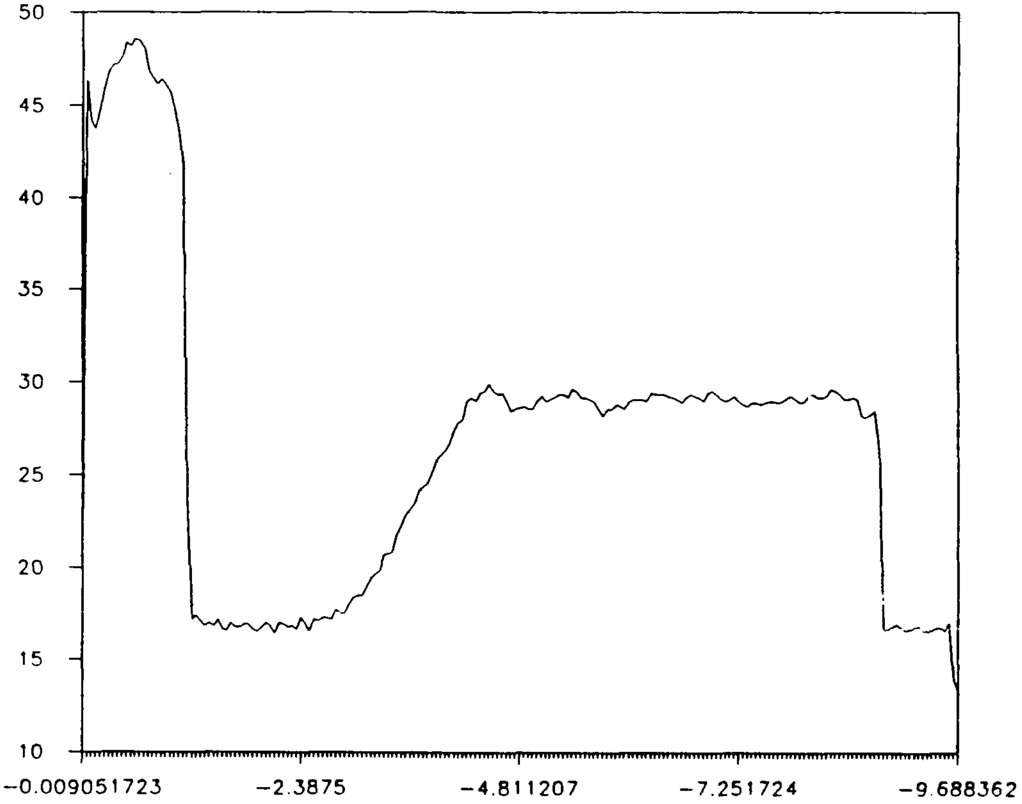

DEC19H-NO CHROMO CONTROLLED AT 50, 10 s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-0.009051723
-2.365086
-4.769397
-7.192242
-9.61638
-12.02457

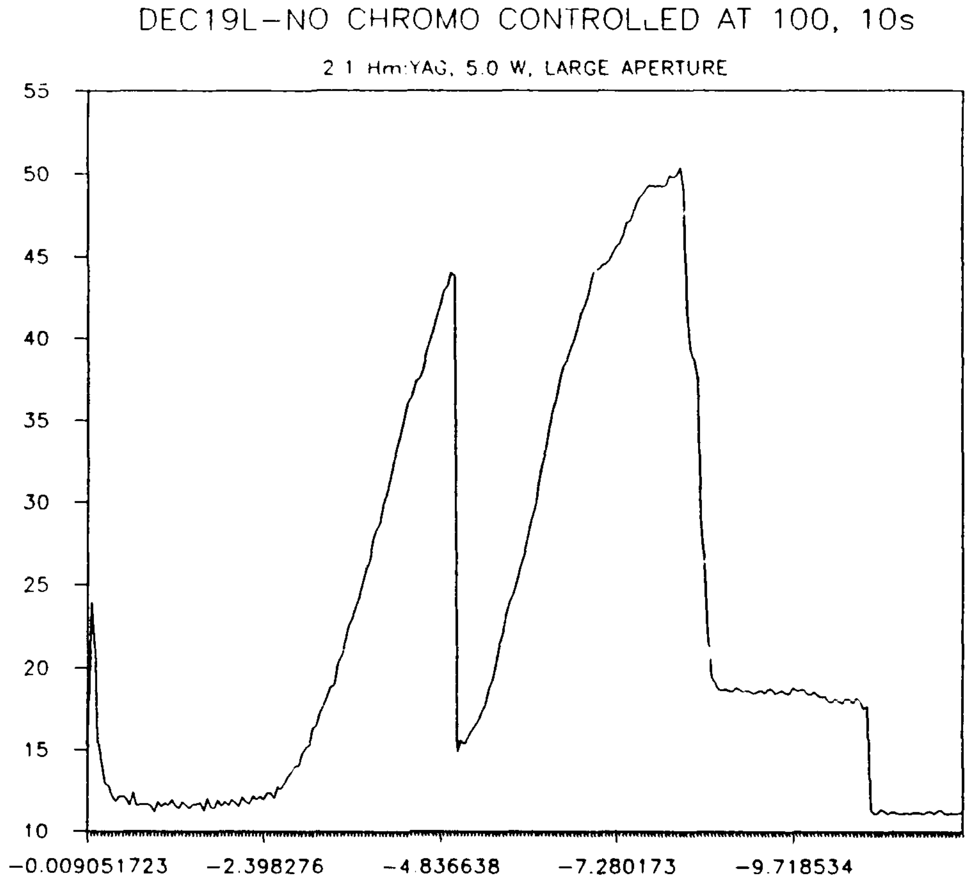

DEC19I-NO CHROMO CONTROLLED AT 60, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
17
16
15
14
13
12
11
10
-0.009482758
-1.190517
-2.384052
-3.590087
-4.805604


DEC19J-NO CHROMO CONTROLLED AT 70, 10 s
2.1 Hm:YAG, 5.0 W. LARGE APERTURE
21
20
19
18
17
16
15
14
13
12
11
-0.009051723
-1.901724
-3.826724
-5.772414
-7.718965

DEC19K– NO CHROMO CONTROLLED AT 80

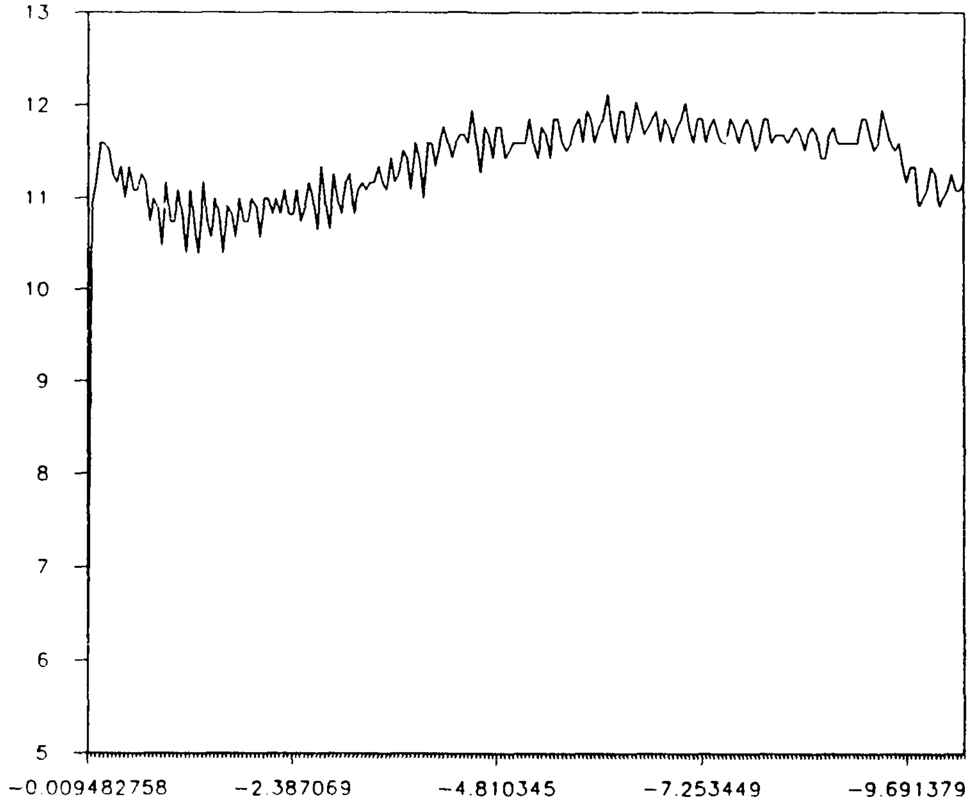
2.1 Hm:YAG, 5.0 W, LARGE APERTURE

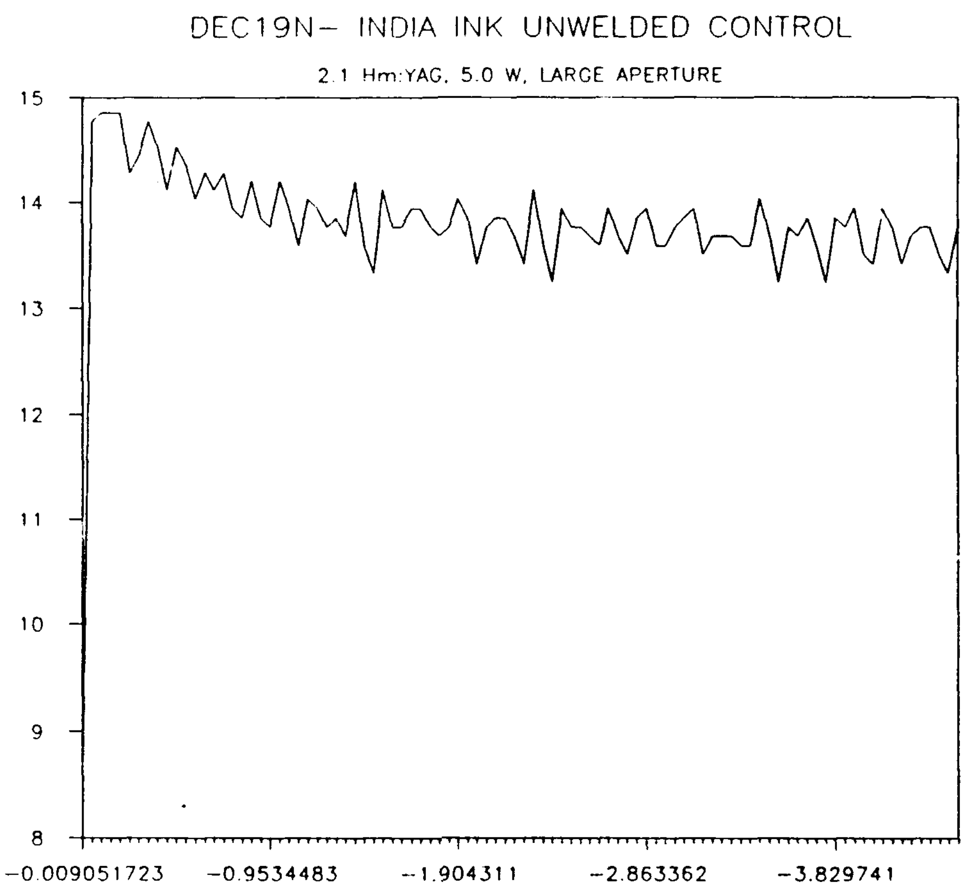


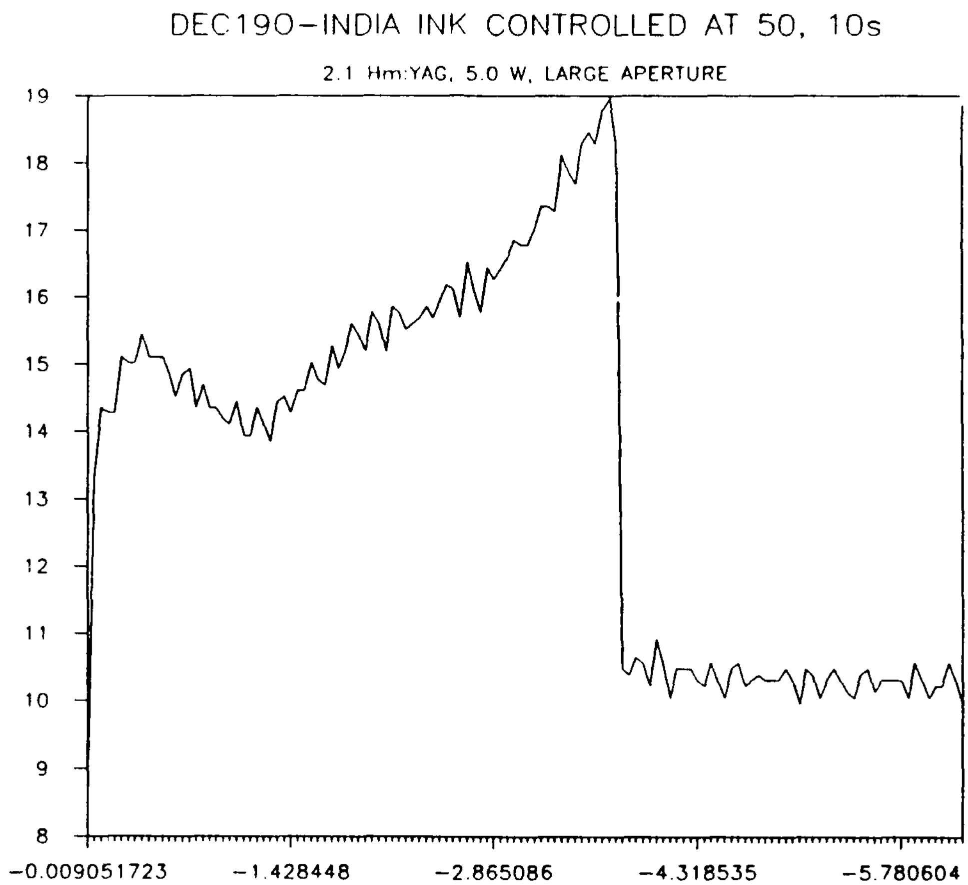

DEC19L-NO CHROMO CONTROLLED AT 100, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
55
50
45
40
35
30
25
20
15
10
-0.009051723
-2.398276
-4.836638
-7.280173
-9.718534

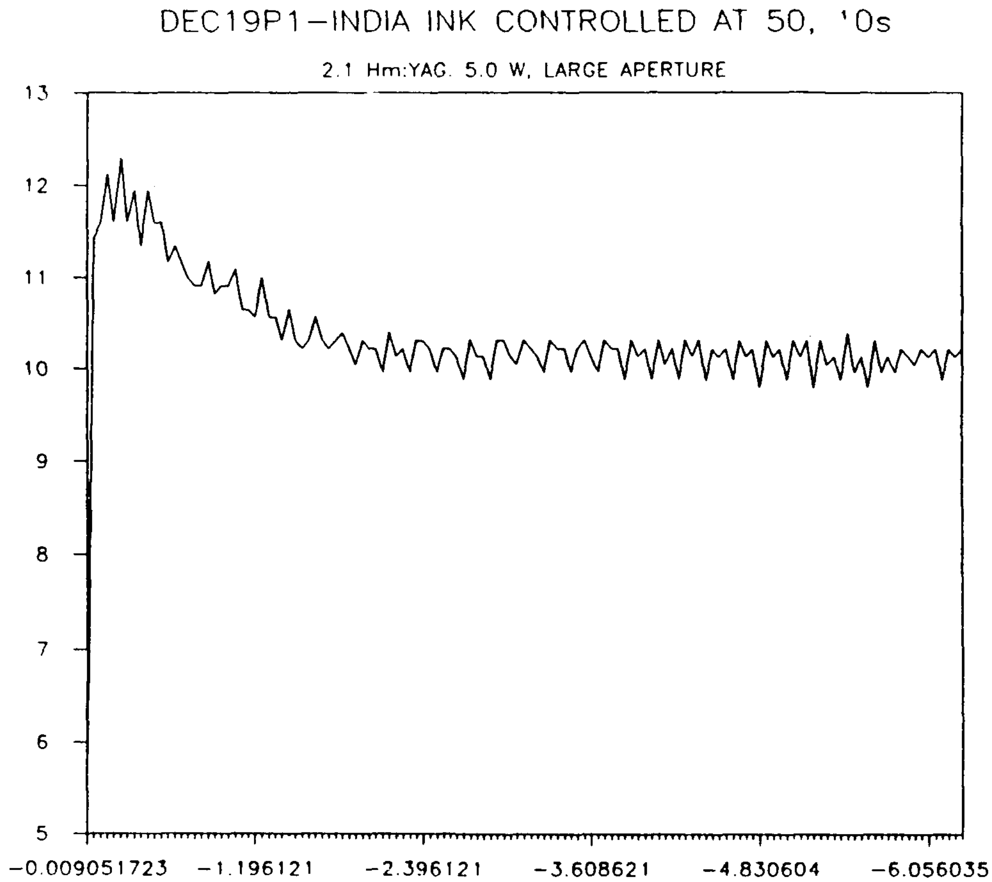
DEC19M– NO CHROMO CONTROLLED AT 50, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE




DEC19N– INDIA INK UNWELDED CONTROL
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
15
14
13
12
11
10
9
8
–0.009051723
–0.9534483
–1.904311
–2.863362
–3.829741

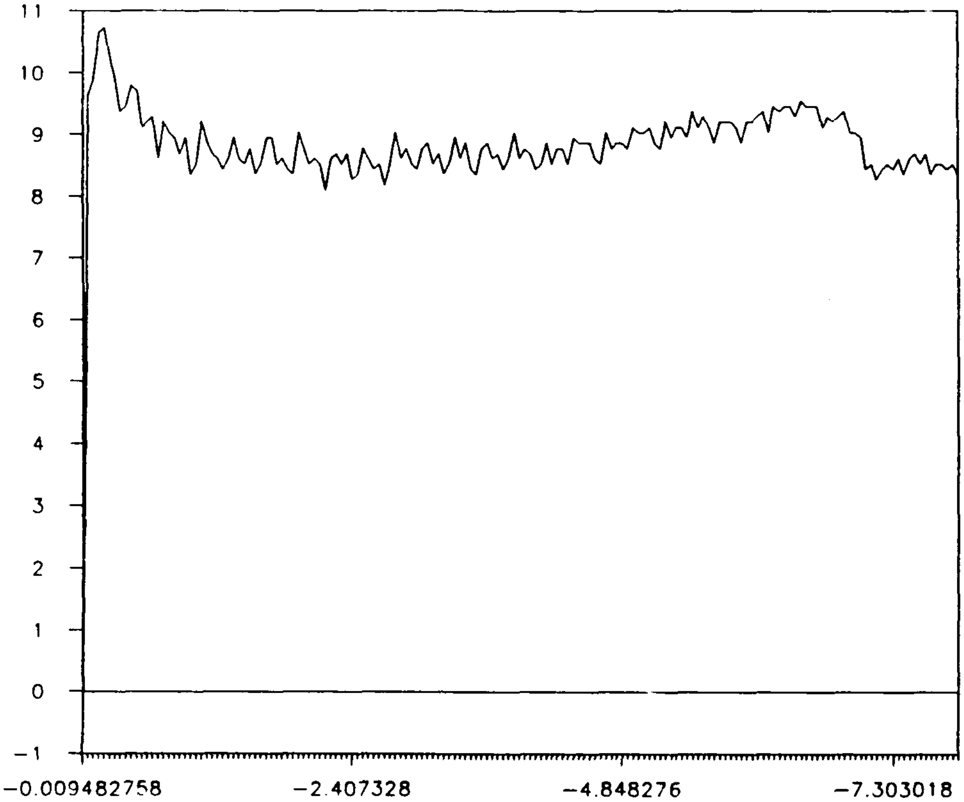

DEC190-INDIA INK CONTROLLED AT 50, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
19
18
17
16
15
14
13
12
11
10
9
8
-0.009051723
-1.428448
-2.865086
-4.318535
-5.780604



DEC19P1–INDIA INK CONTROLLED AT 50, '0s
2.1 Hm:YAG. 5.0 W, LARGE APERTURE
13
12
11
10
9
8
7
6
5
–0.009051723
–1.196121
–2.396121
–3.608621
–4.830604
–6.056035

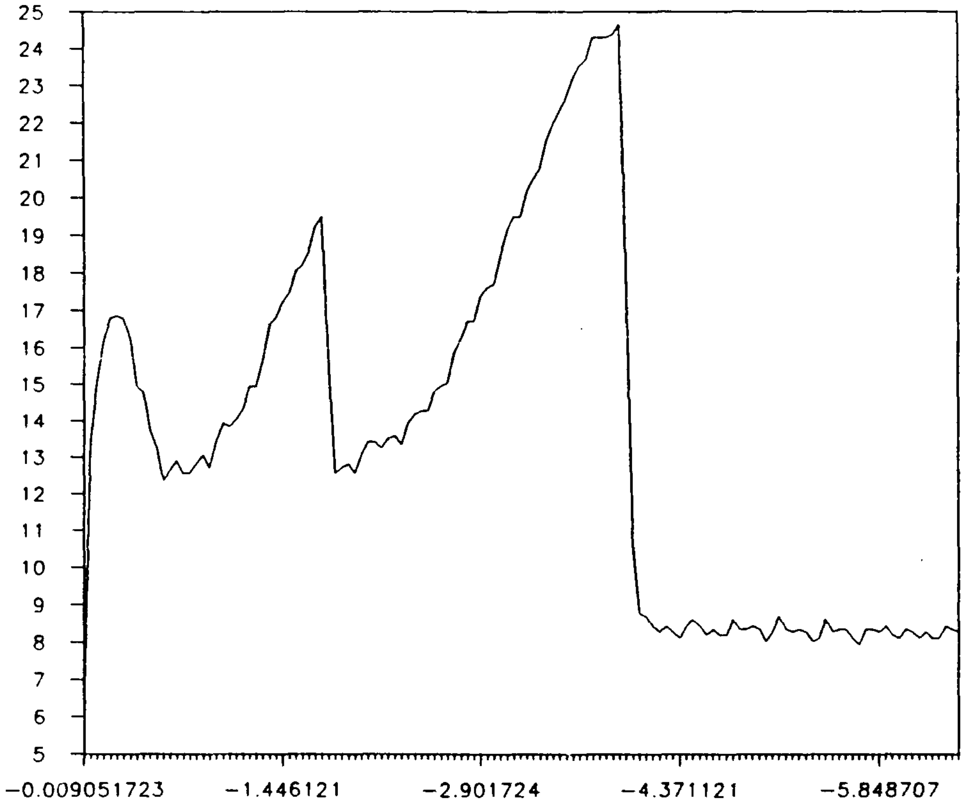
DEC19Q-INDIA INK CONTROLLED AT 60, 10s

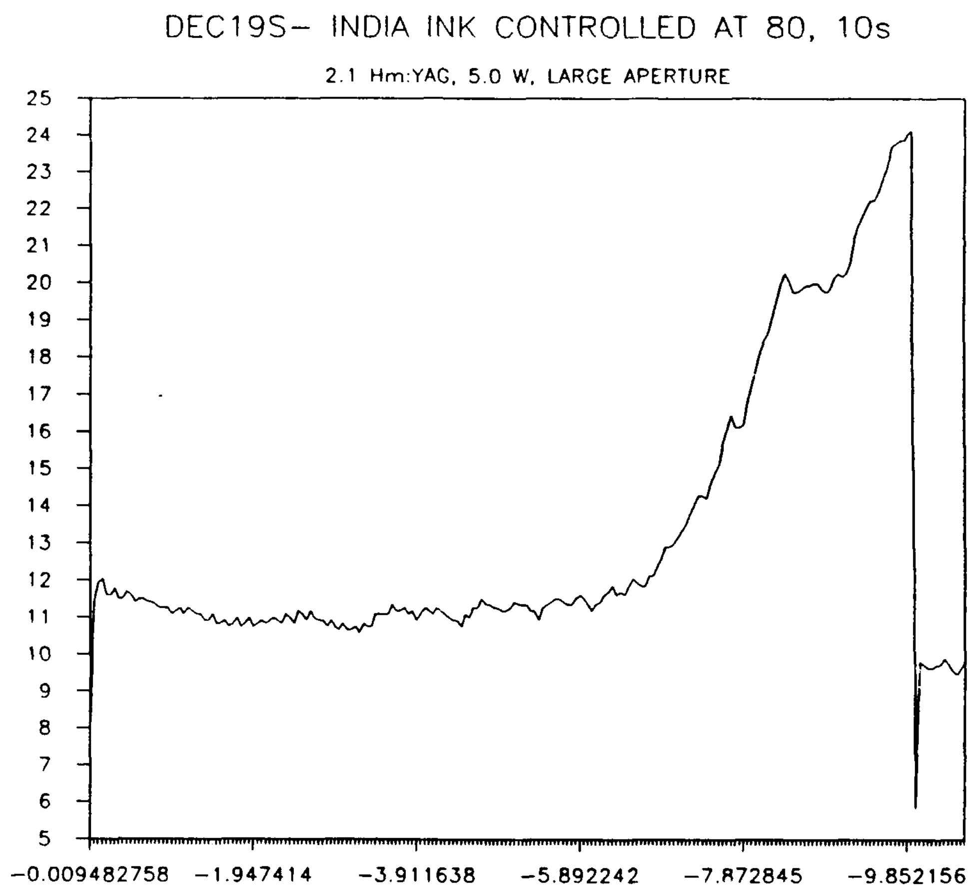
2.1 Hm:YAG, 5.0 W, LARGE APERTURE



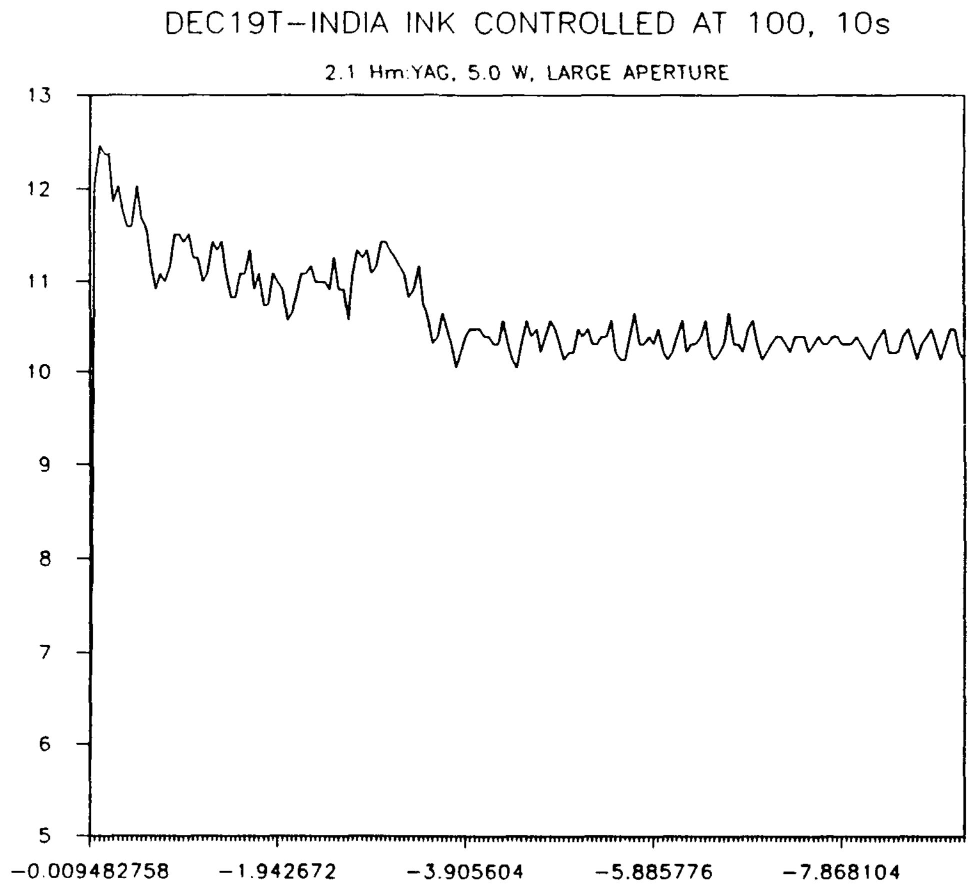
DEC19R– INDIA INK CONTROLLED AT 70, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



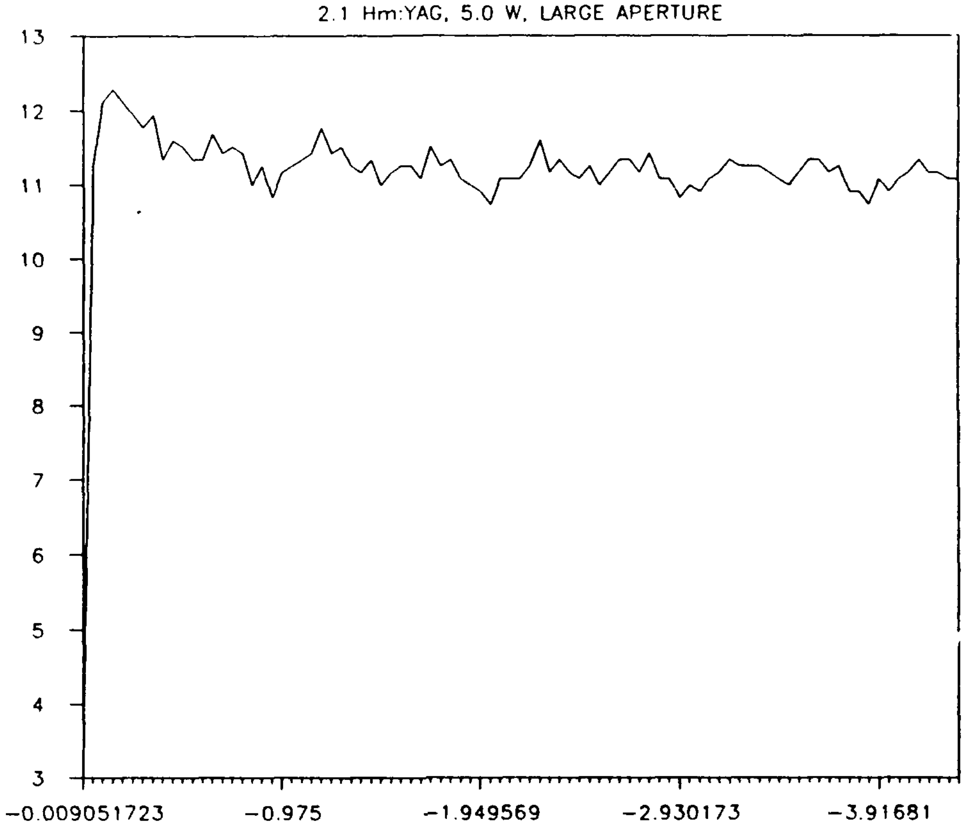


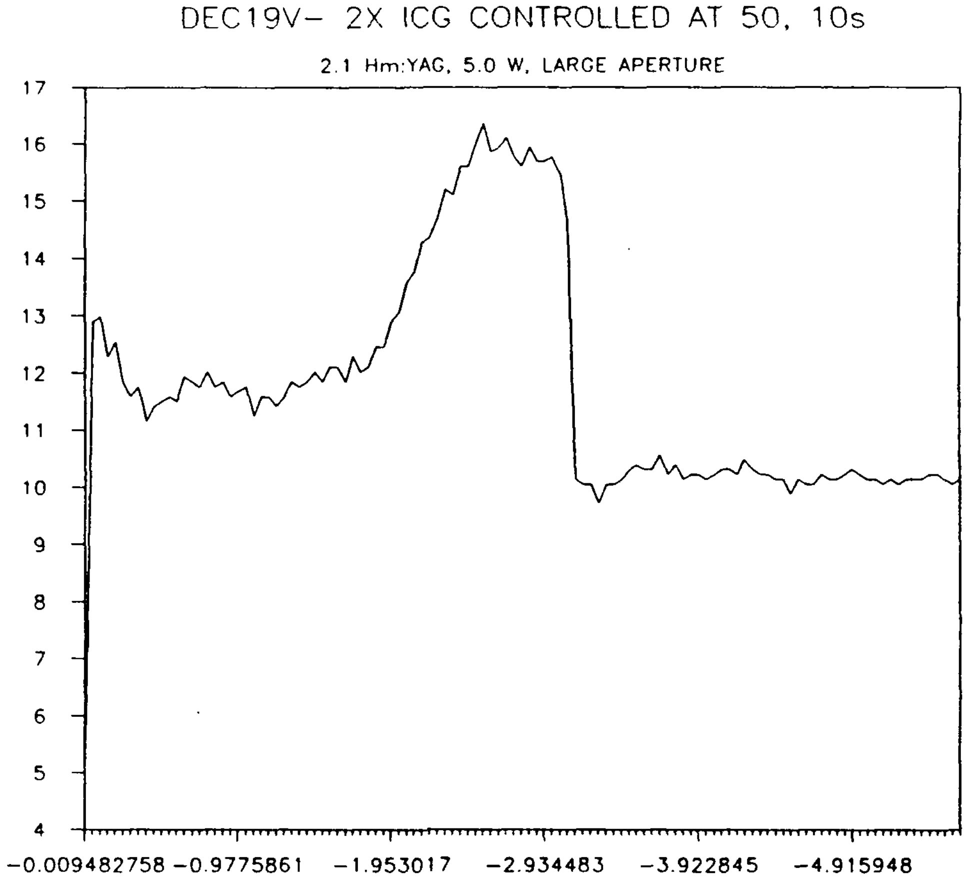
DEC19S– INDIA INK CONTROLLED AT 80, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
−0.009482758
−1.947414
−3.911638
−5.892242
−7.872845
−9.852156

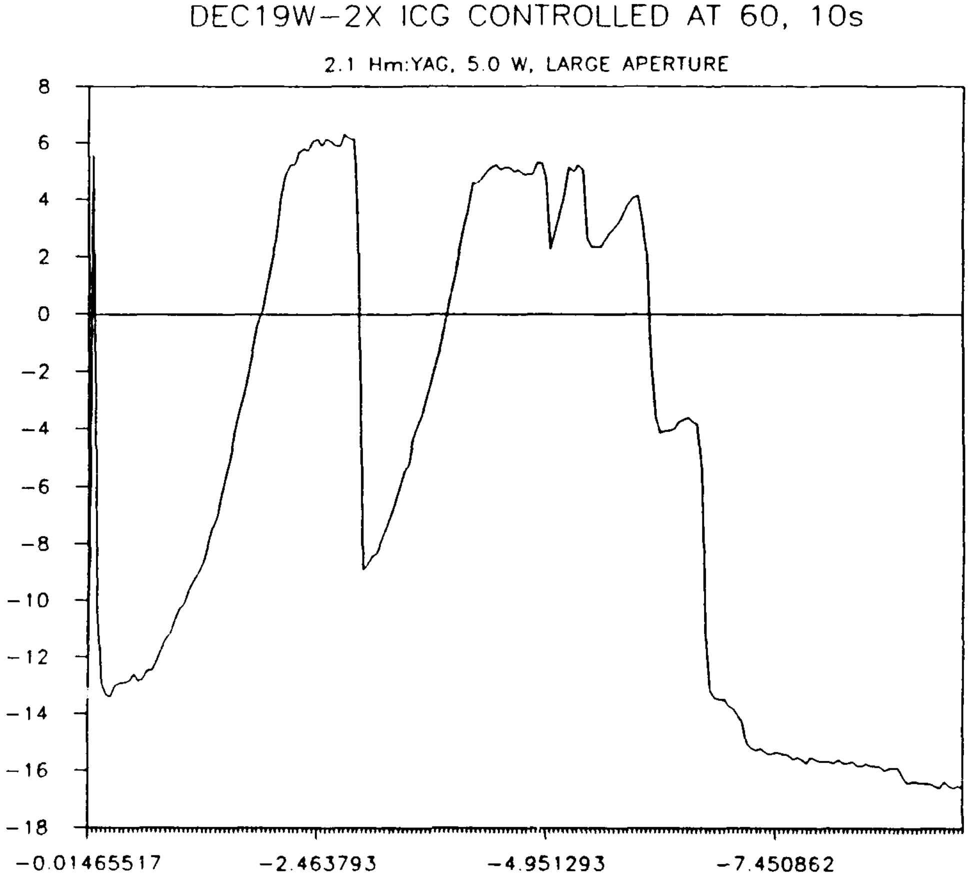

DEC19T-INDIA INK CONTROLLED AT 100, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
13
12
11
10
9
8
7
6
5
-0.009482758
-1.942672
-3.905604
-5.885776
-7.868104

DEC19U-2X iCG UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, LARGE APERTURE

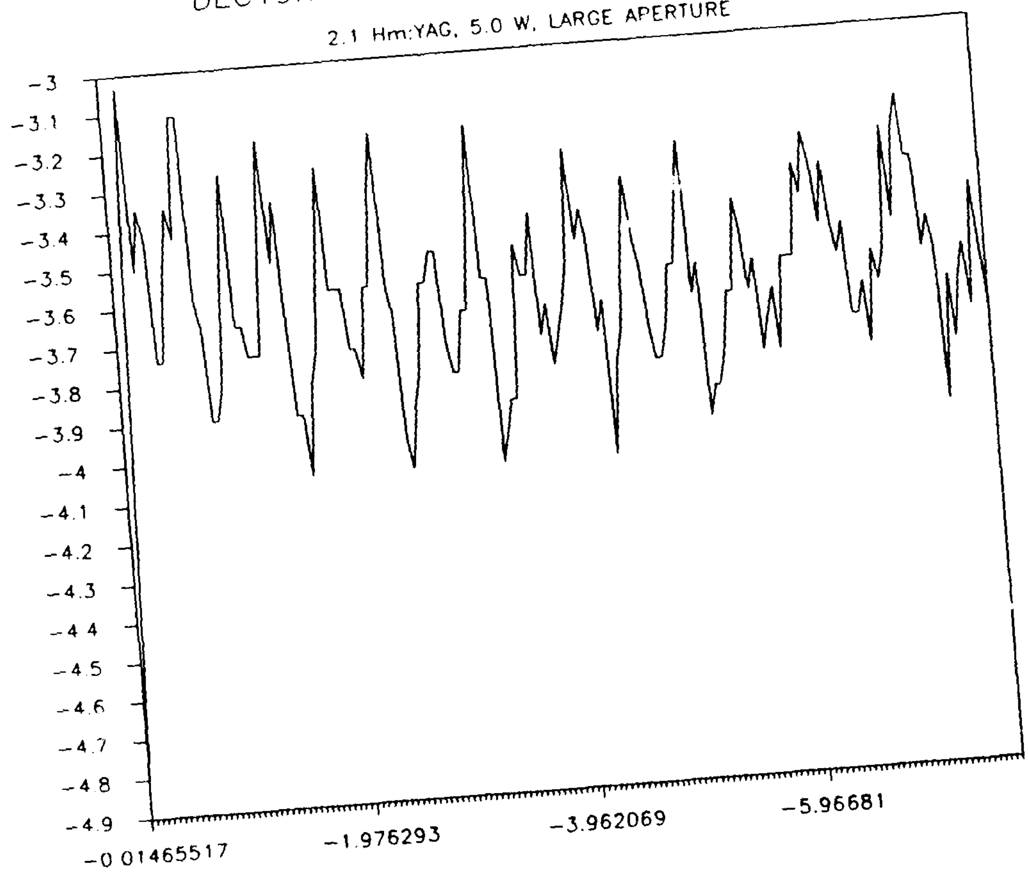


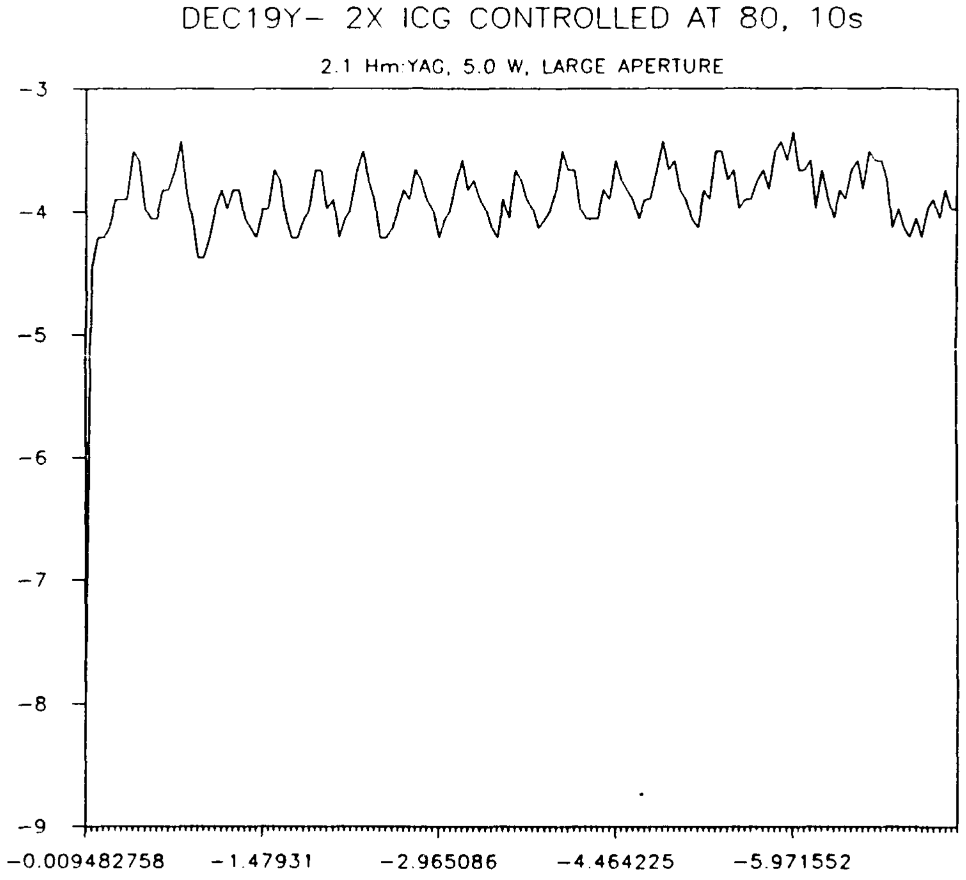

DEC19V– 2X ICG CONTROLLED AT 50, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
17
16
15
14
13
12
11
10
9
8
7
6
5
4
–0.009482758
–0.9775861
–1.953017
–2.934483
–3.922845
–4.915948


DEC19W−2X ICG CONTROLLED AT 60, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
8
6
4
2
0
−2
−4
−6
−8
−10
−12
−14
−16
−18
−0.01465517
−2.463793
−4.951293
−7.450862

DEC19X-2X ICG CONTROLLED AT 70, 10s

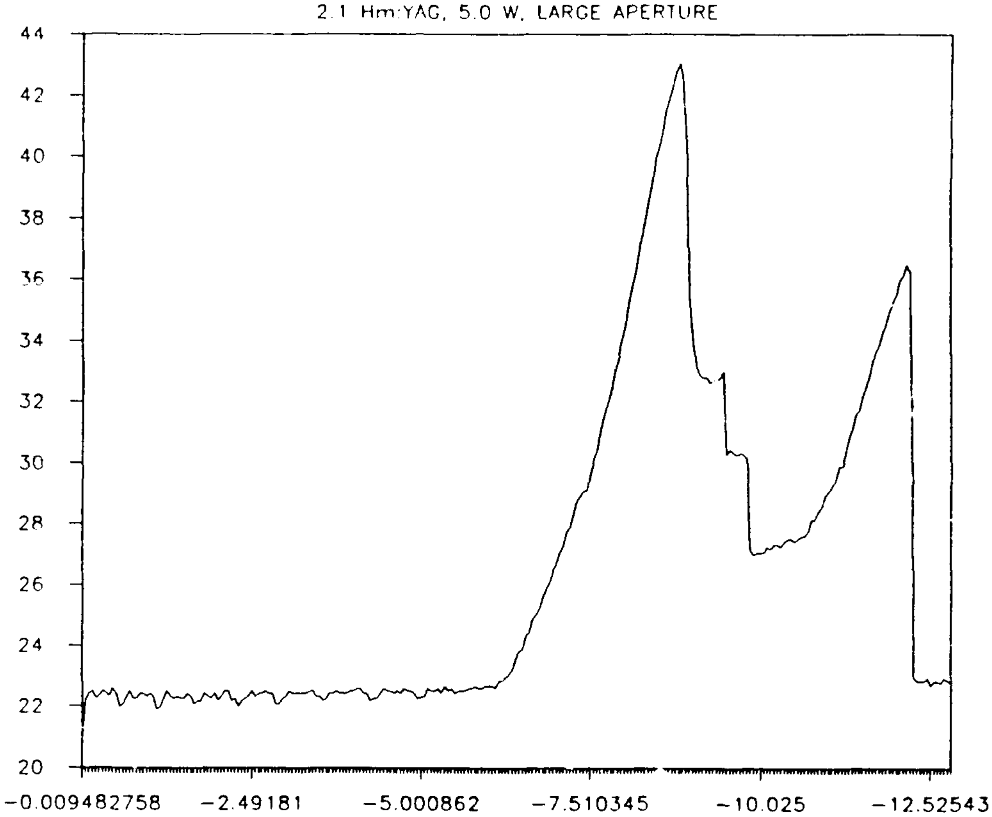
2.1 Hm:YAG, 5.0 W, LARGE APERTURE

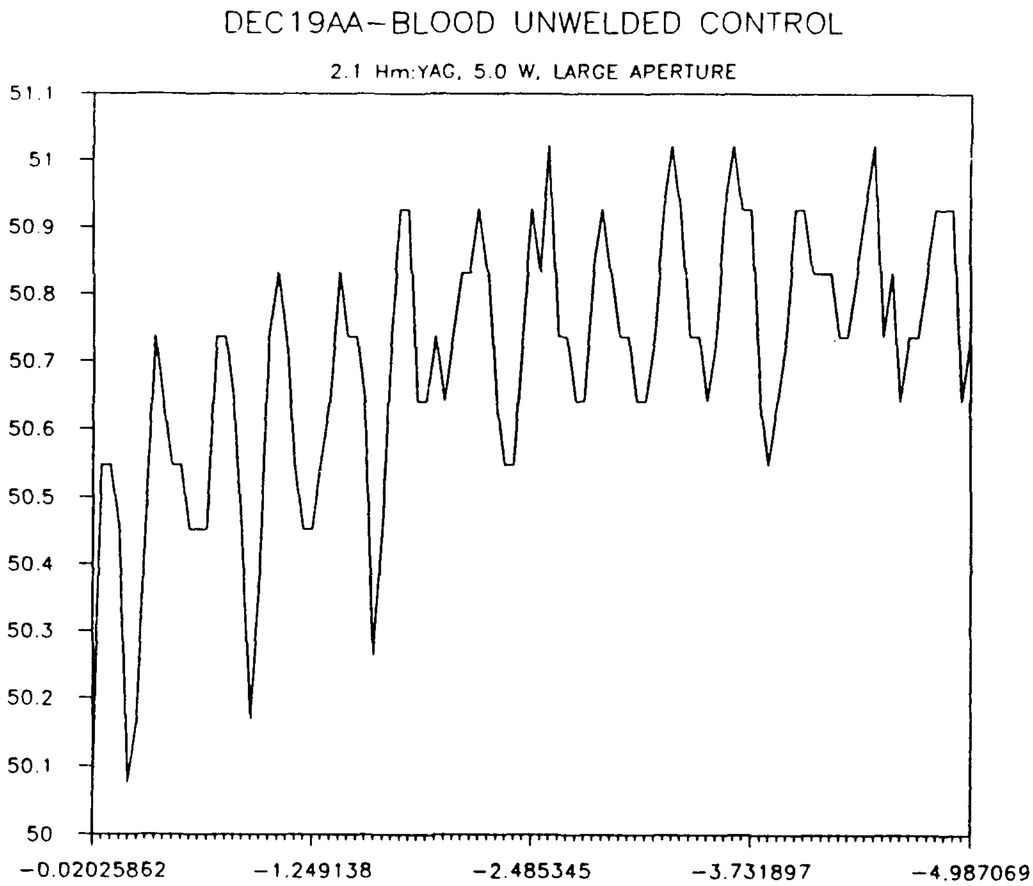



DEC19Y– 2X ICG CONTROLLED AT 80, 10s
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
–3
–4
–5
–6
–7
–8
–9
–0.009482758
–1.47931
–2.965086
–4.464225
–5.971552

DEC19Z-2X ICG CONTROLLED AT 100, 10s

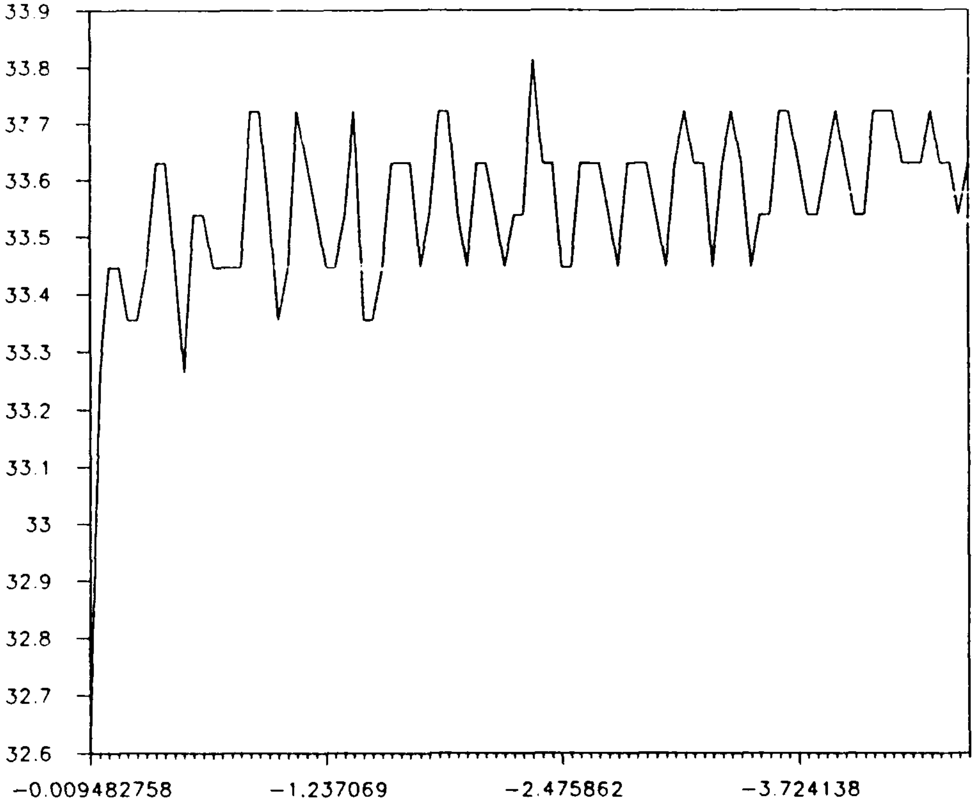
2.1 Hm:YAG, 5.0 W, LARGE APERTURE

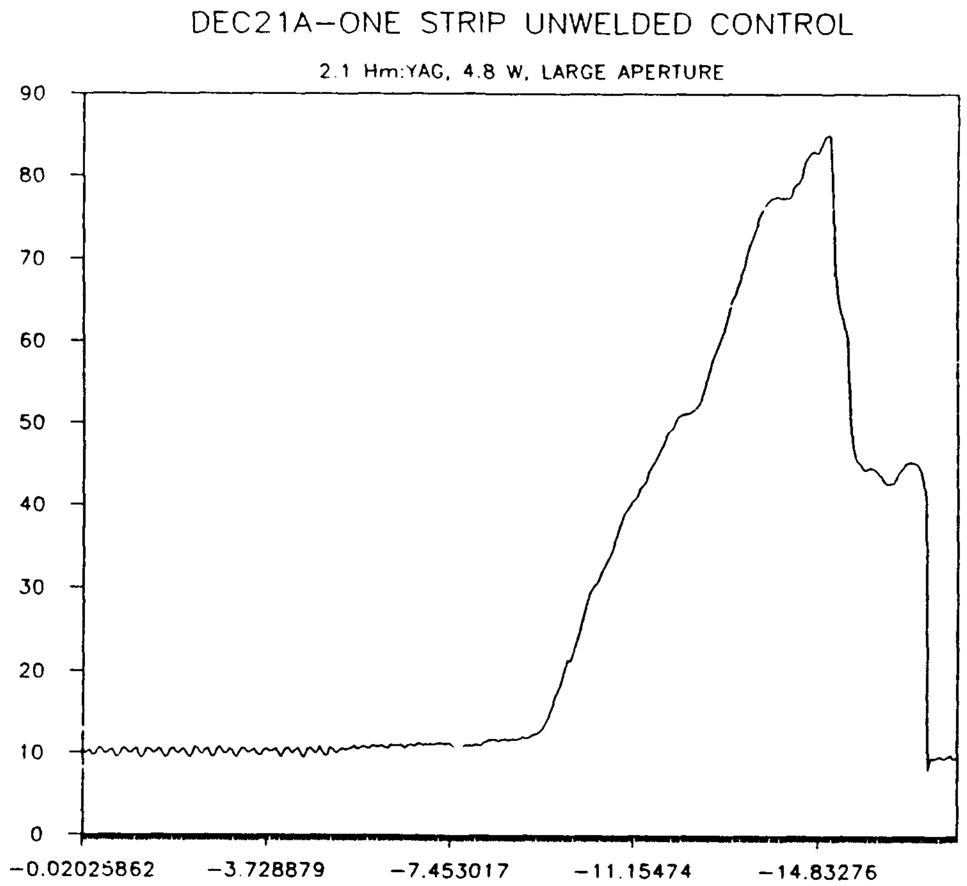



DEC19AA-BLOOD UNWELDED CONTROL
2.1 Hm:YAG, 5.0 W, LARGE APERTURE
51.1
51
50.9
50.8
50.7
50.6
50.5
50.4
50.3
50.2
50.1
50
-0.02025862
-1.249138
-2.485345
-3.731897
-4.987069

DEC19AB-BLOOD CONTROLLED AT 50, 10s

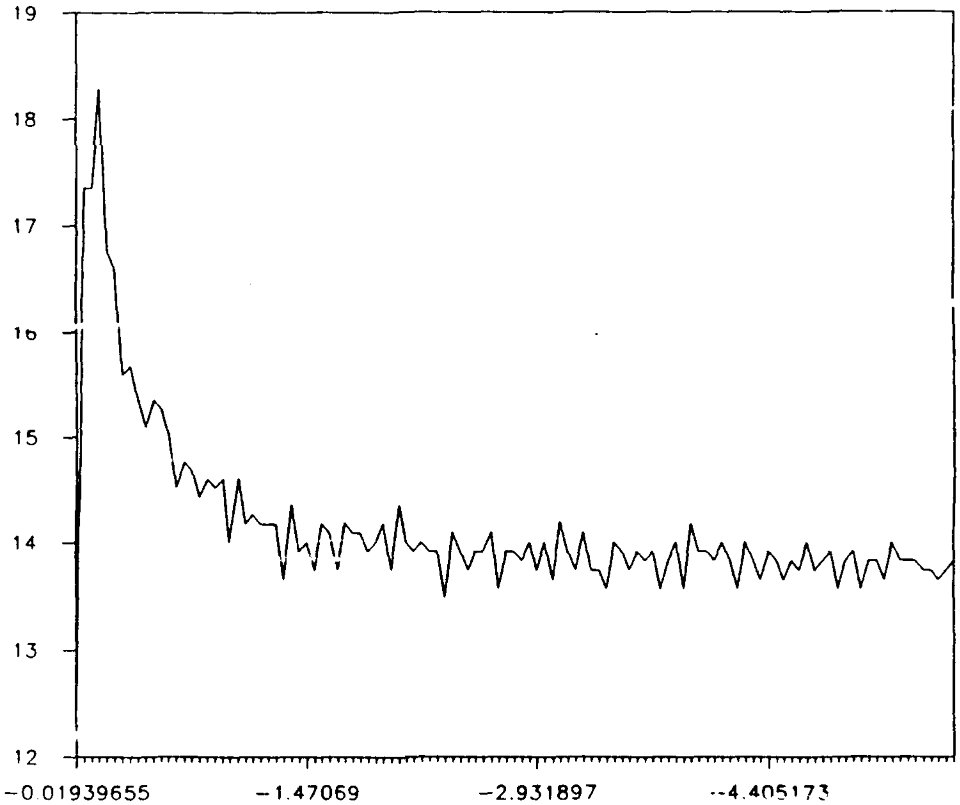
2.1 Hm:YAG, 5.0 W, LARGE APERTURE




DEC21A-ONE STRIP UNWELDED CONTROL
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
90
80
70
60
50
40
30
20
10
0
-0.02025862
-3.728879
-7.453017
-11.15474
-14.83276

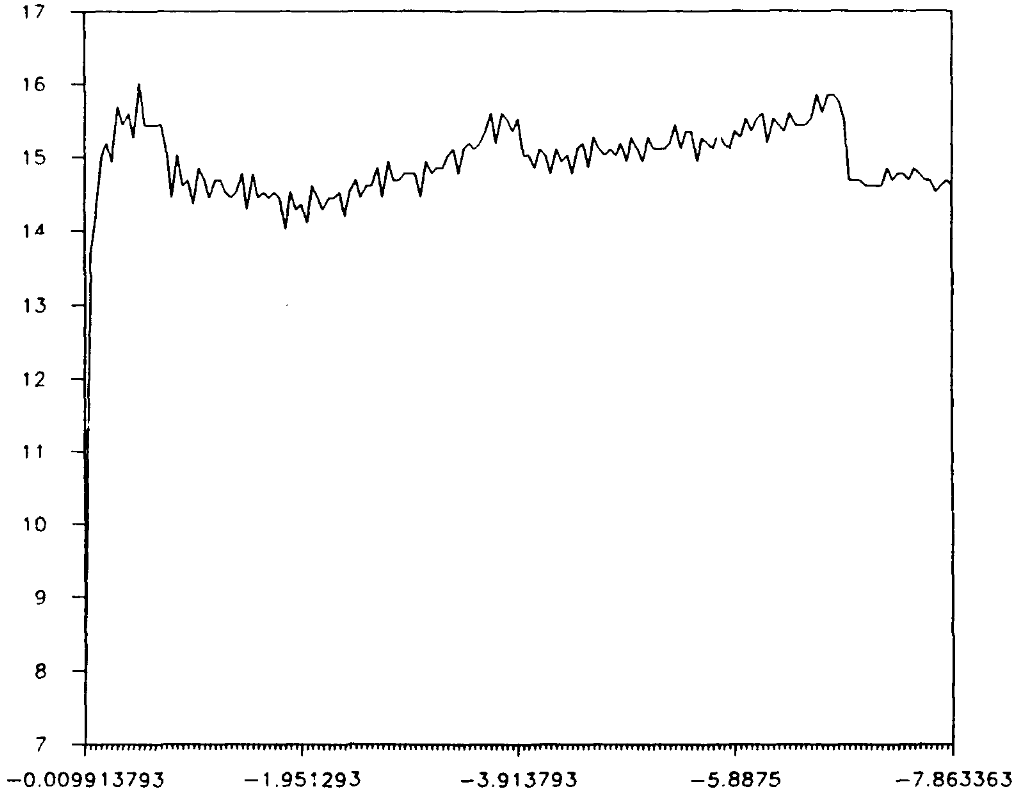
DEC21AA1-NO CHROMO CONTROLLED AT 70,10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



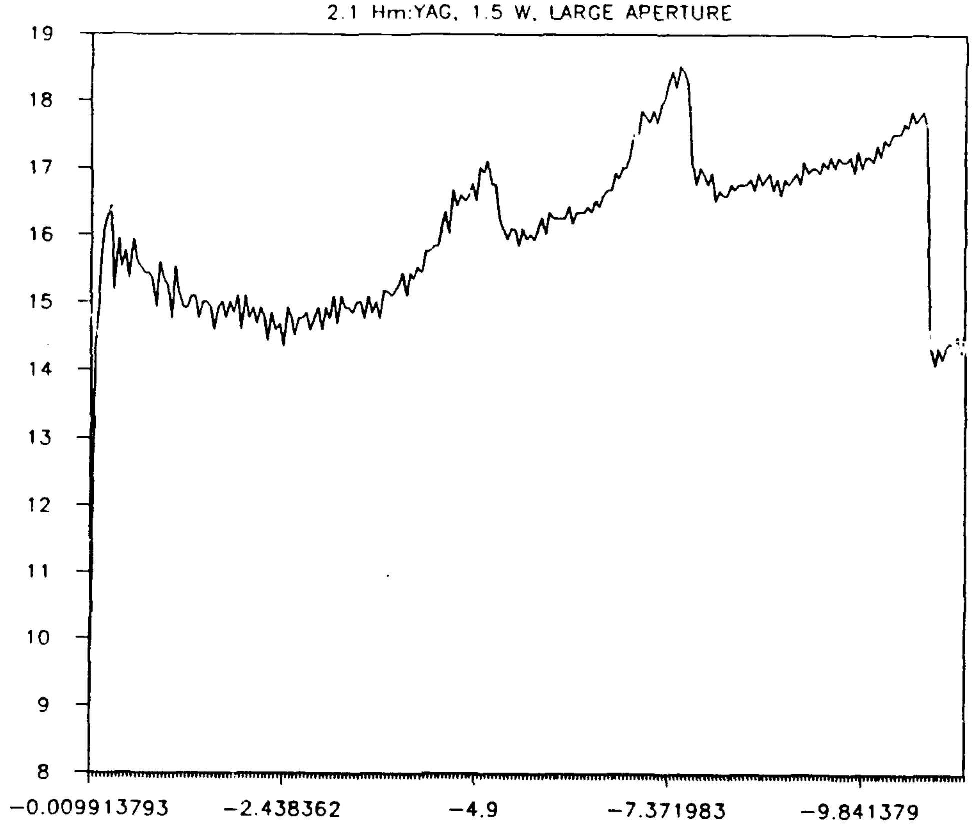
DEC21AB–NO CHROMO CONTROLLED AT 80, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



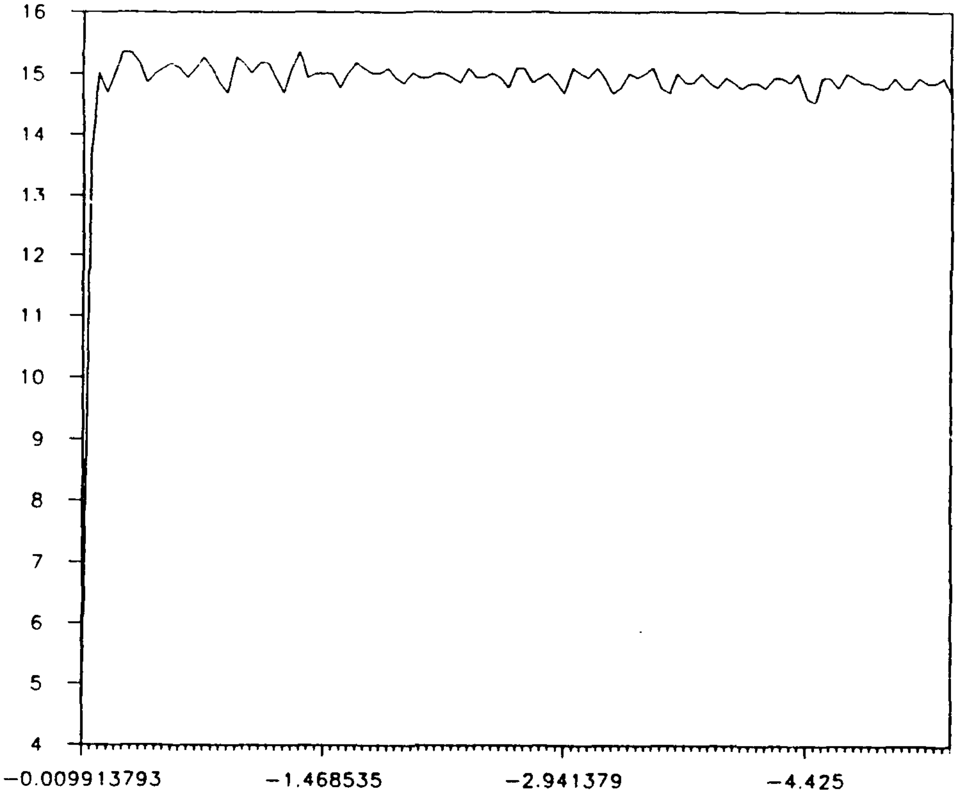
DEC21AC-NO CHROMO CONTROLLED AT 100,10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



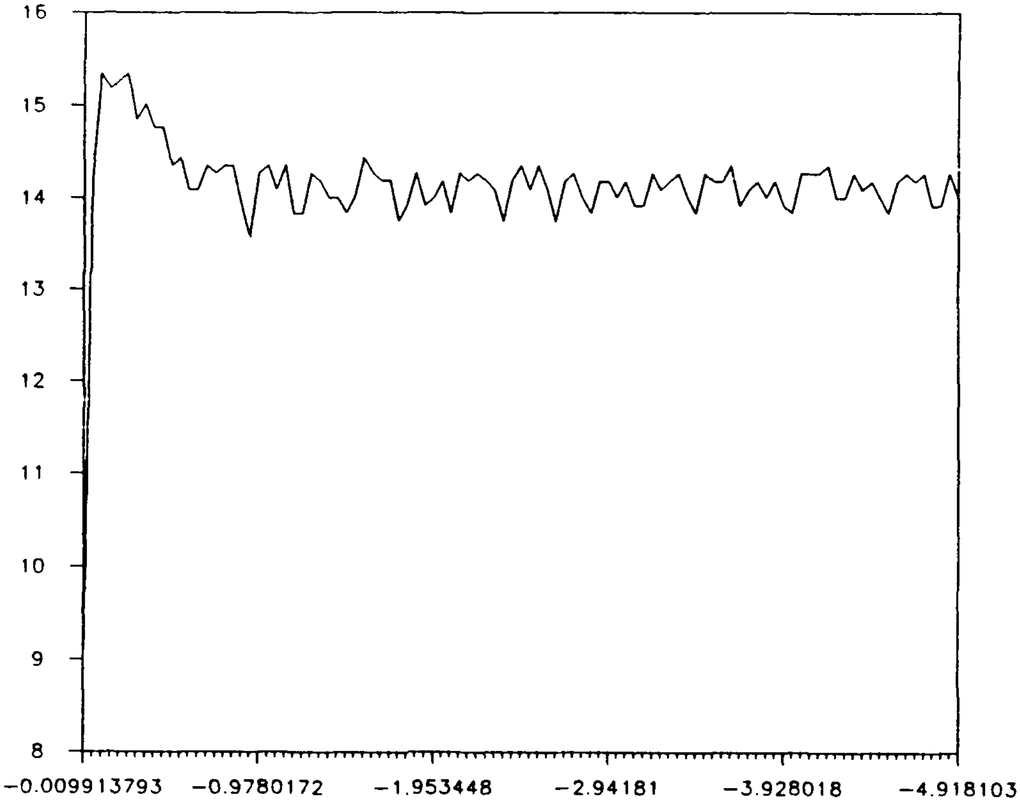
DEC21AD-INDIA INK UNWELDED CONTROL

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



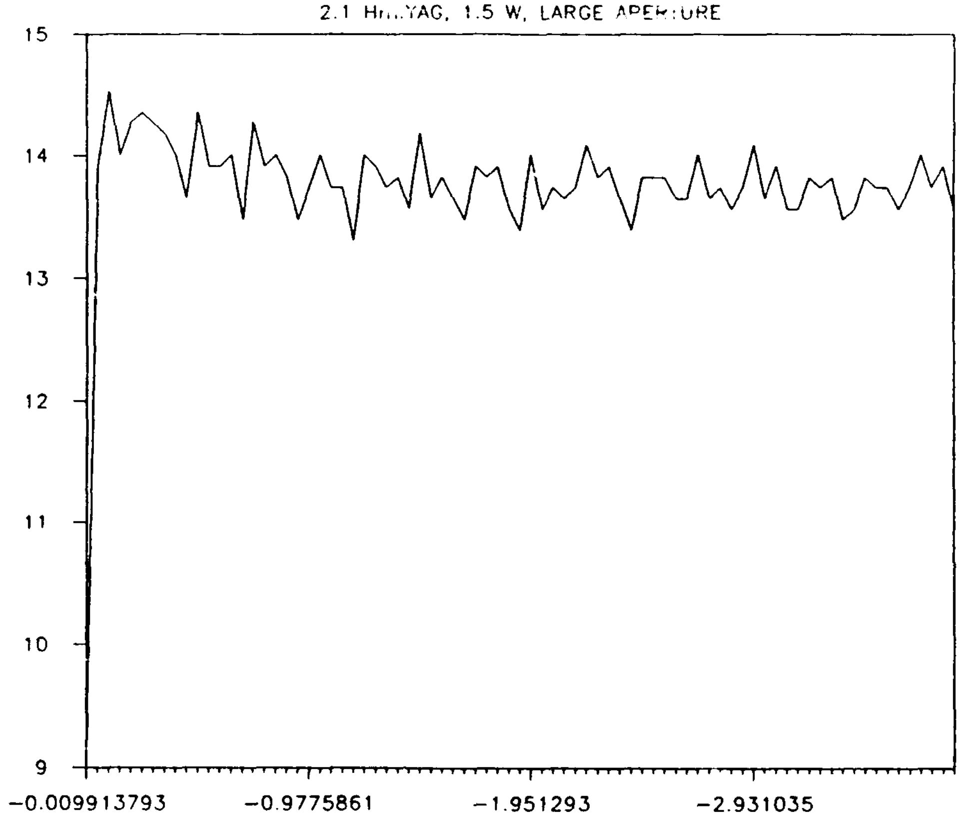
DEC21AE-INDIA INK CONTROLLED AT 50,10s

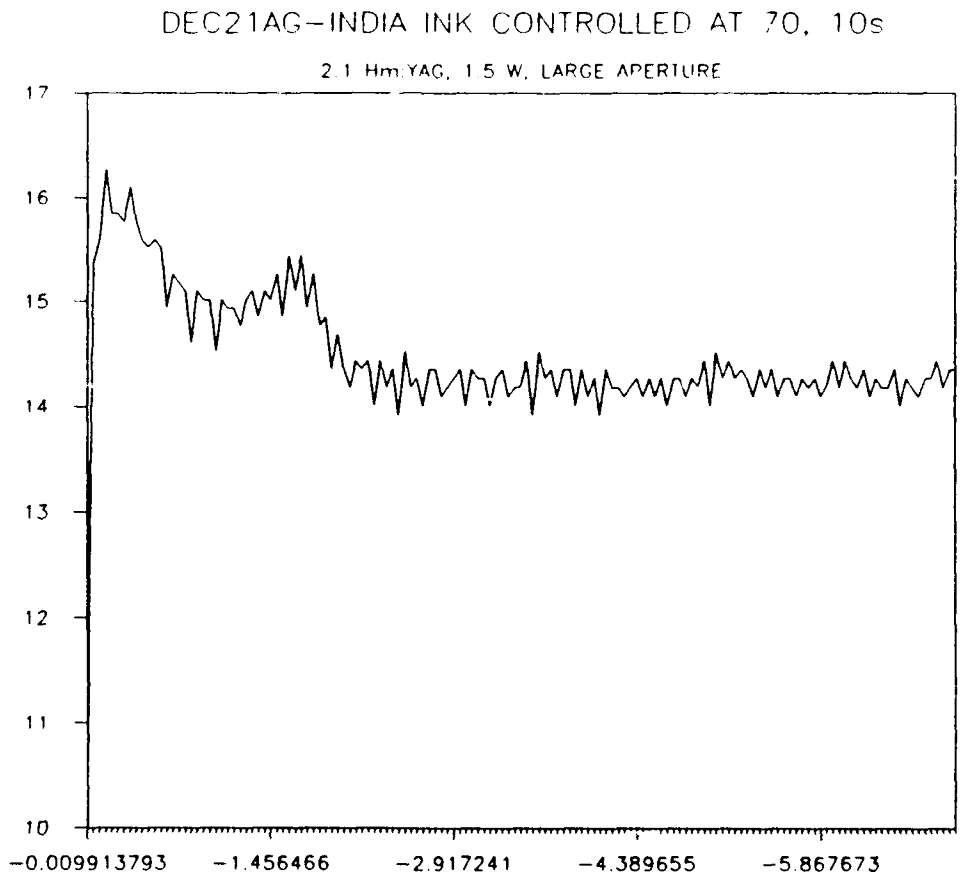
2.1 Hm:YAG, 1.5 W, LARGE APERTURE

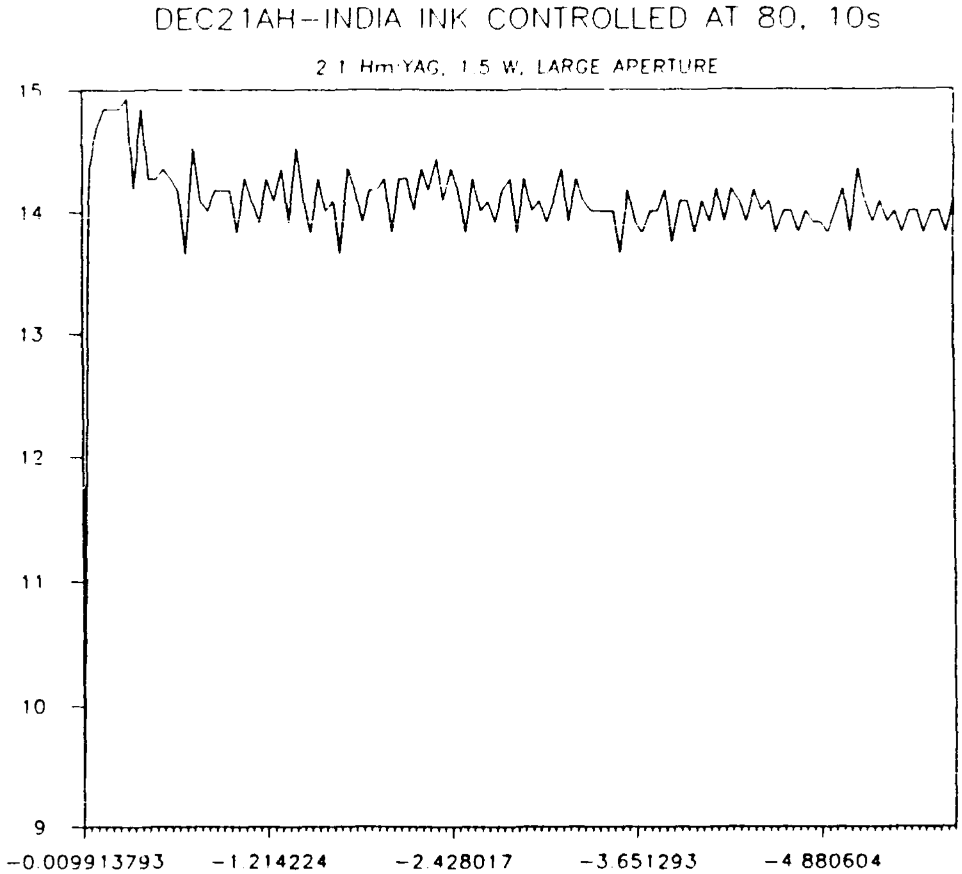


DEC21AF-INDIA INK CONTROLLED AT 60, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



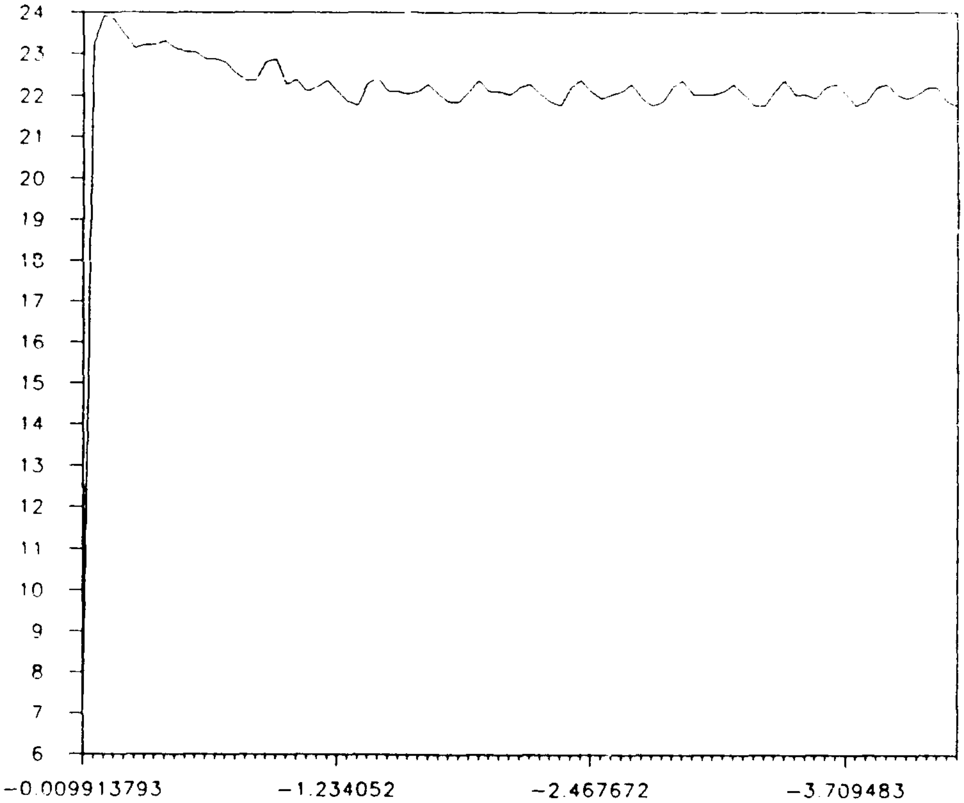

DEC21AG-INDIA INK CONTROLLED AT 70, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
17
16
15
14
13
12
11
10
-0.009913793
-1.456466
-2.917241
-4.389655
-5.867673

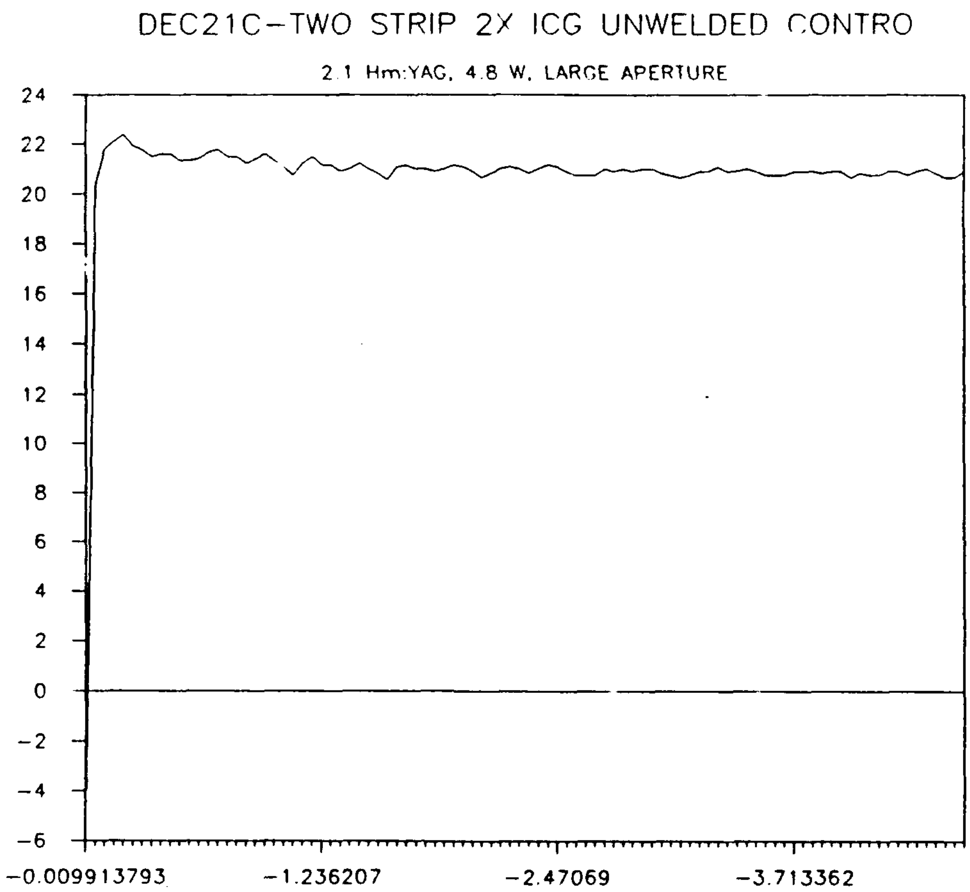


DEC21AH--INDIA INK CONTROLLED AT 80, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
15
14
13
12
11
10
9
-0.009913793
-1.214224
-2.428017
-3.651293
-4.880604

DEC21B-TWO STRIP UNWELDED CONTROL

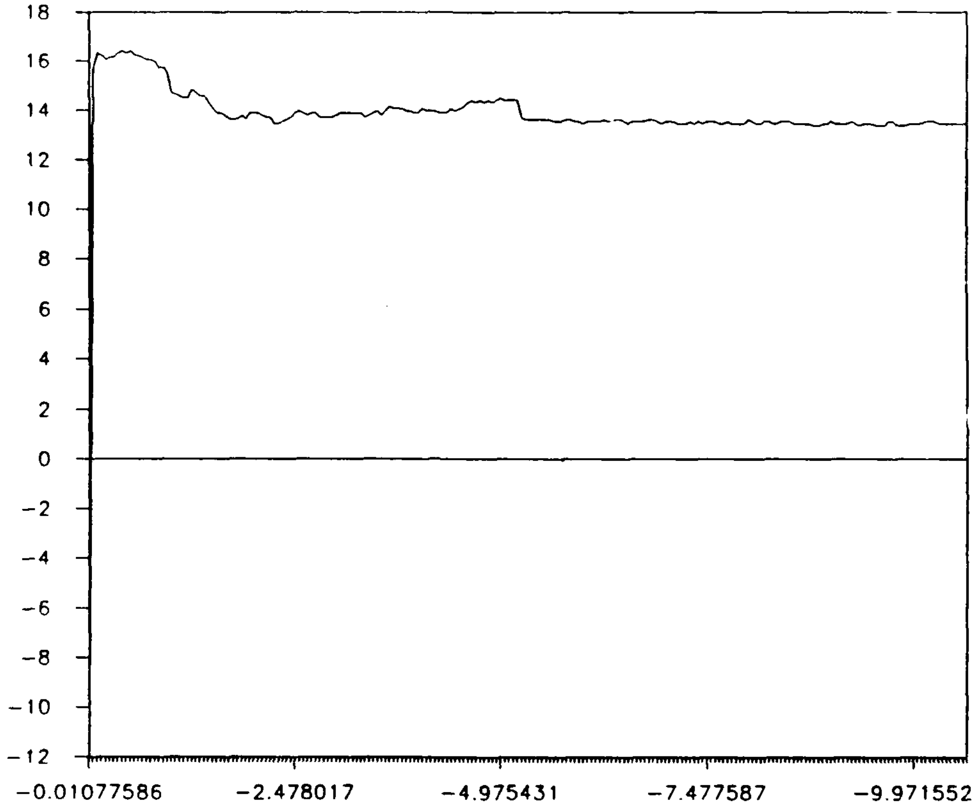
2.1 Hm:YAG, 4.8 W, LARGE APERTURE

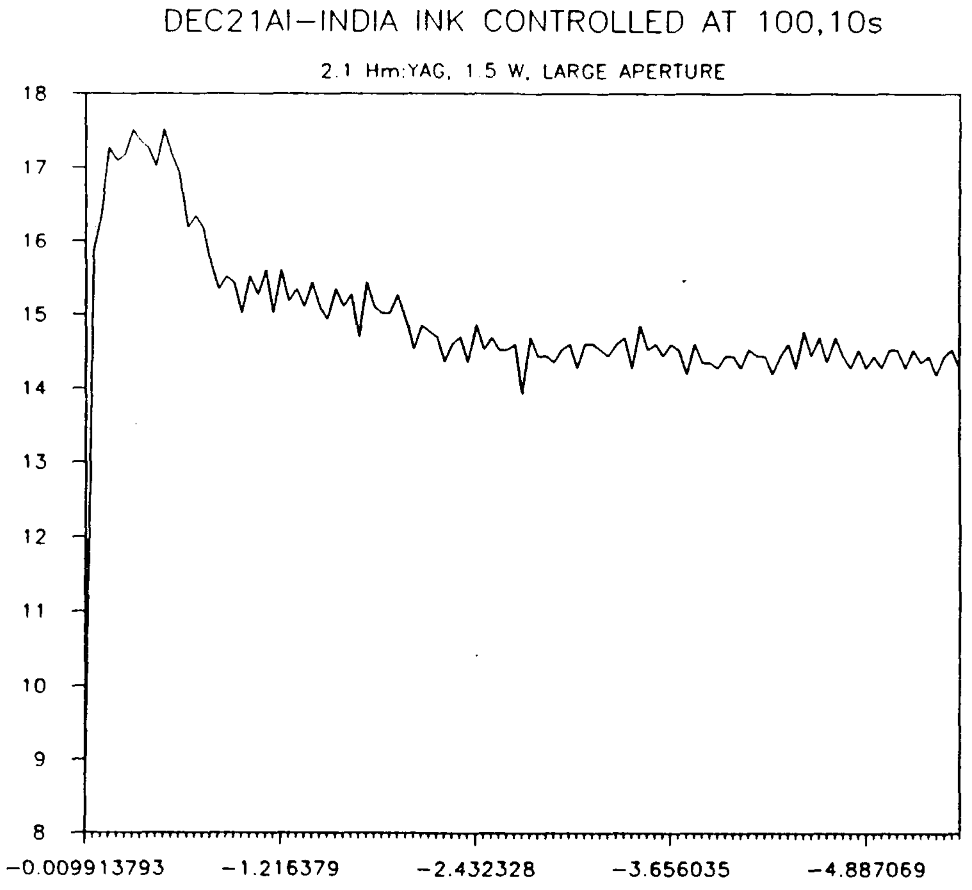



DEC21C-TWO STRIP 2X ICG UNWELDED CONTRO
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-0.009913793
-1.236207
-2.47069
-3.713362

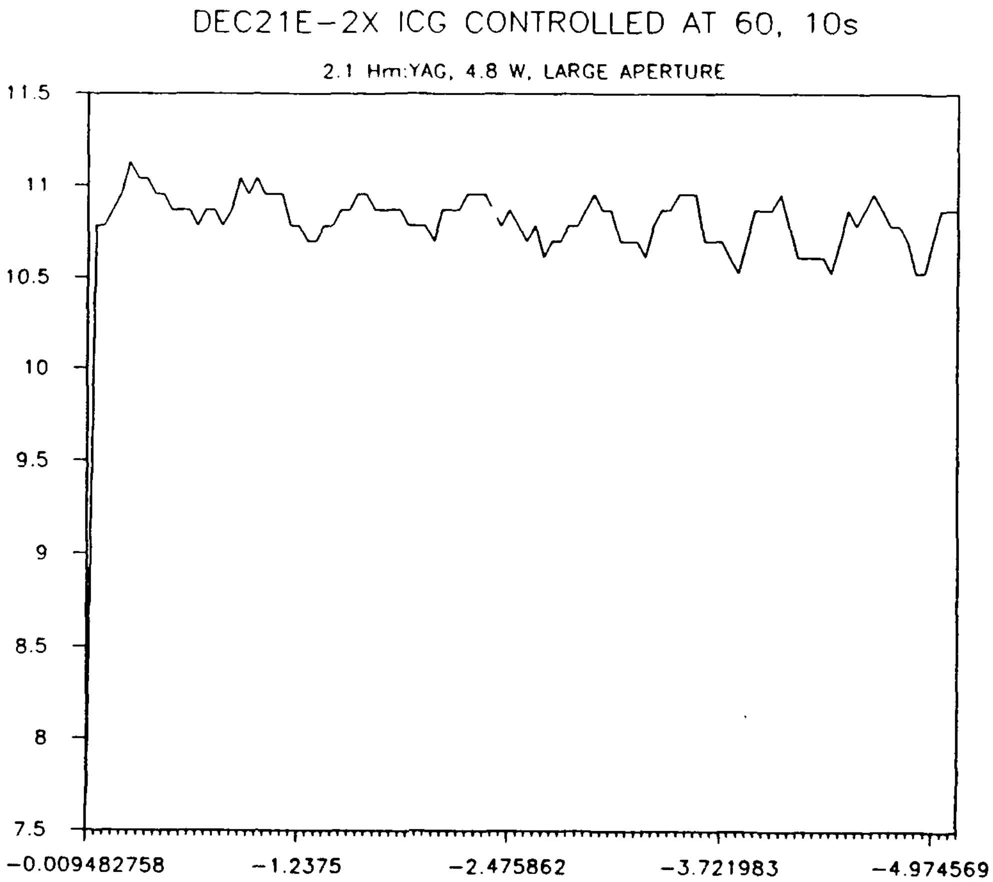
DEC21D-2X ICG CONTROLLED AT 50, 10s

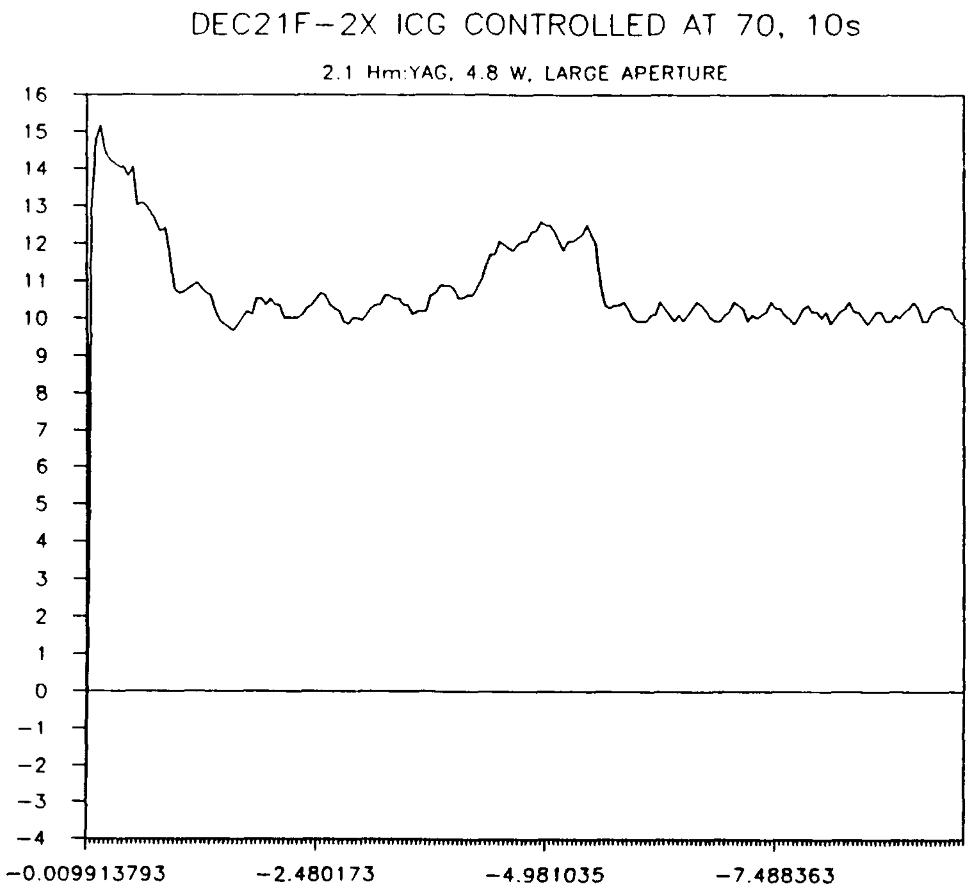
2.1 Hm:YAG, 4.8 W, LARGE APERTURE

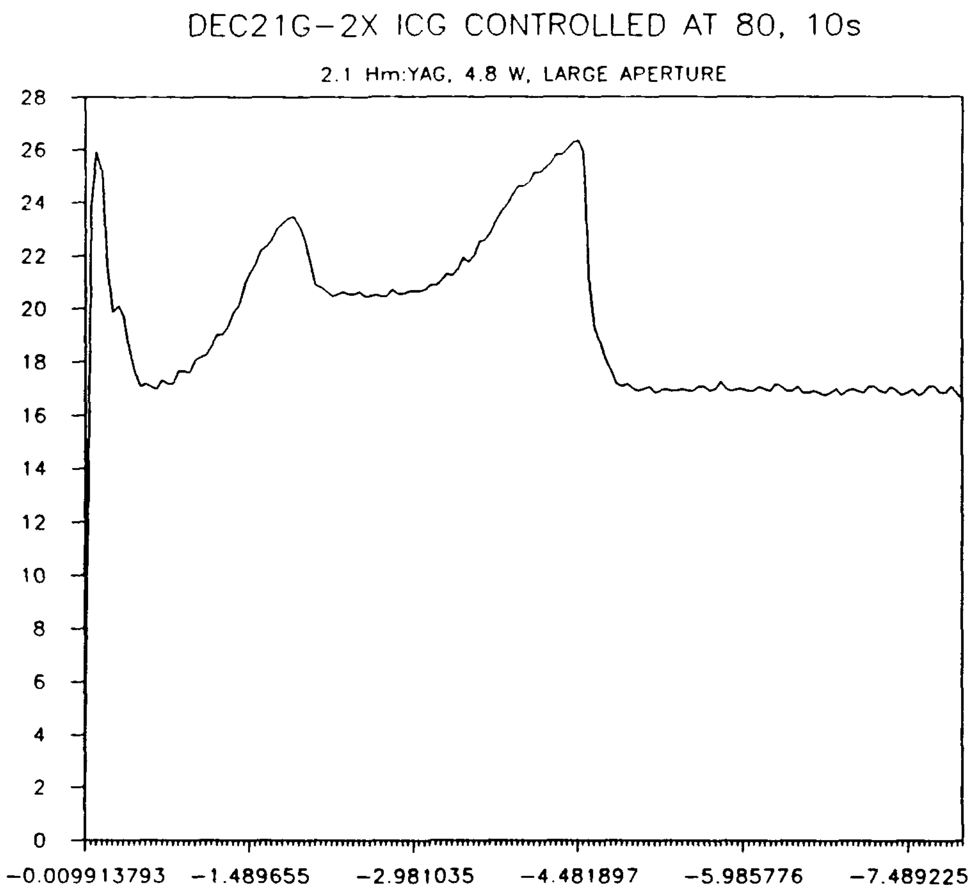


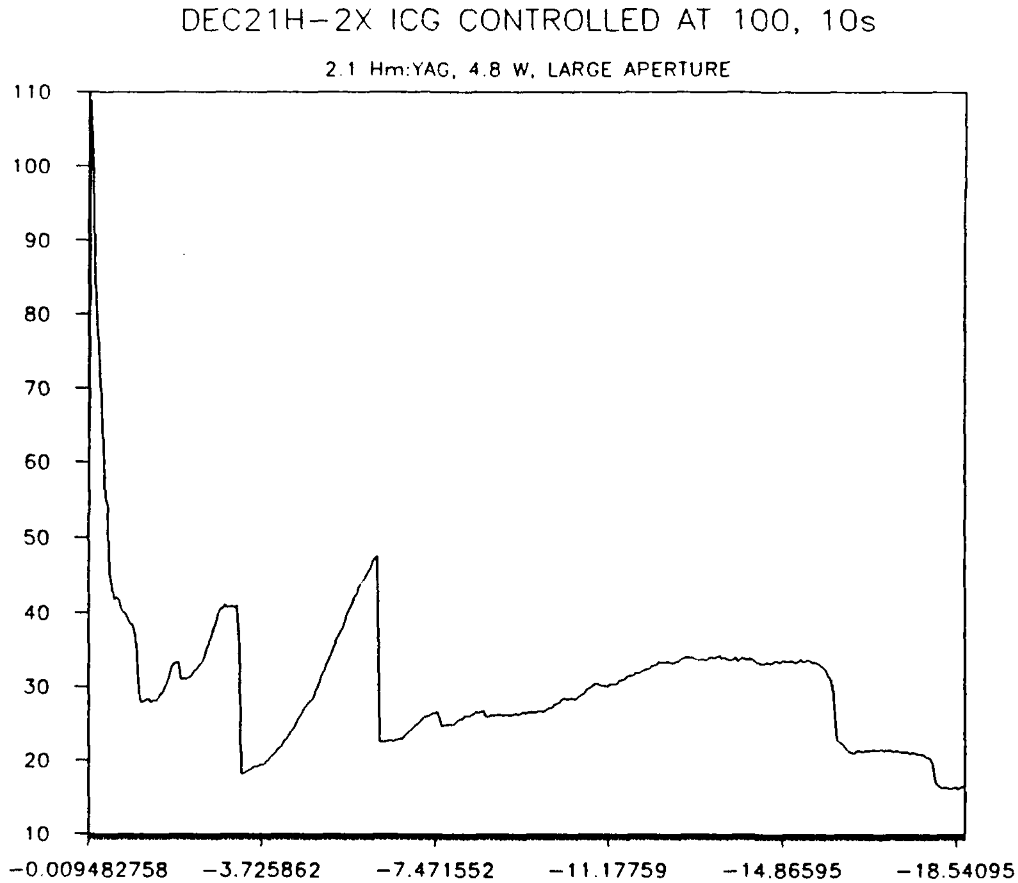


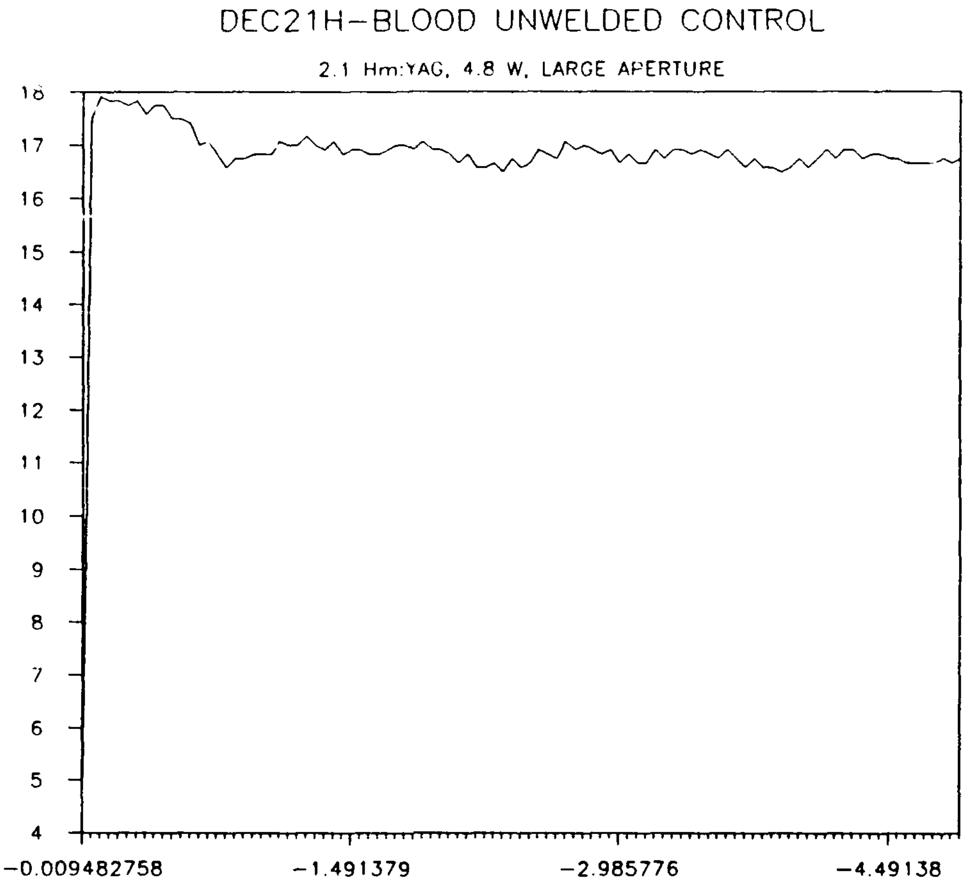
DEC21AI—INDIA INK CONTROLLED AT 100,10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
18
17
16
15
14
13
12
11
10
9
8
−0.009913793
−1.216379
−2.432328
−3.656035
−4.887069

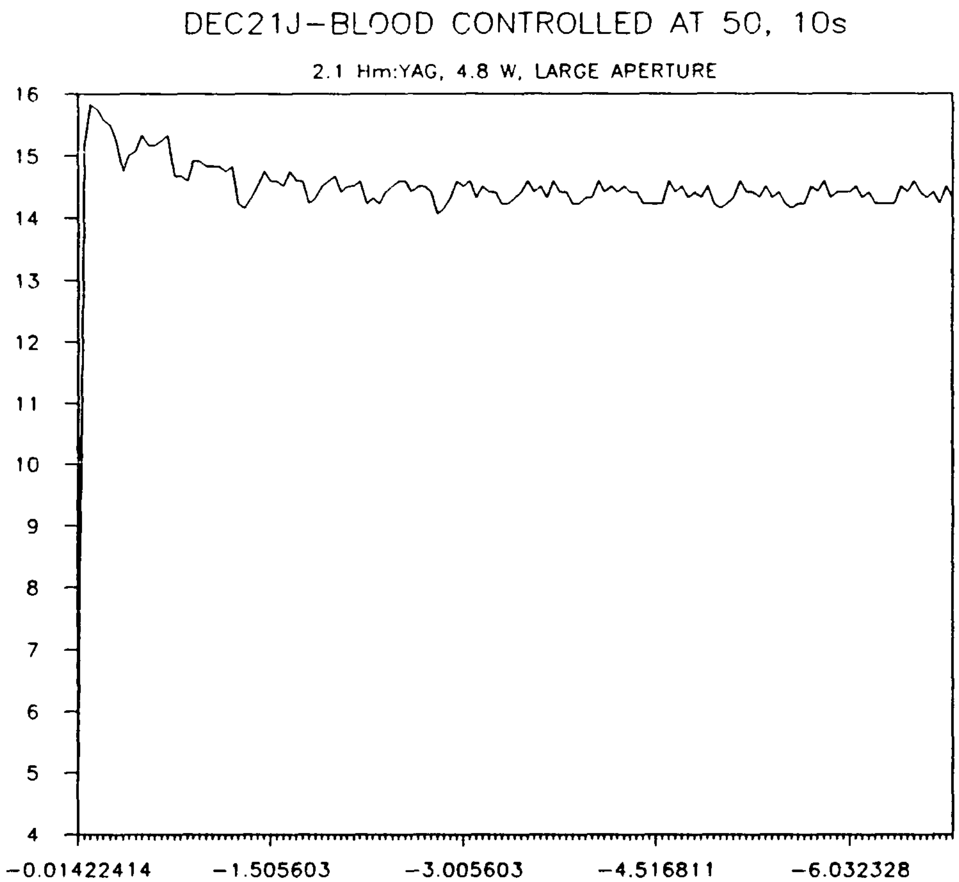

DEC21E-2X ICG CONTROLLED AT 60, 10s
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
11.5
11
10.5
10
9.5
9
8.5
8
7.5
-0.009482758
-1.2375
-2.475862
-3.721983
-4.974569

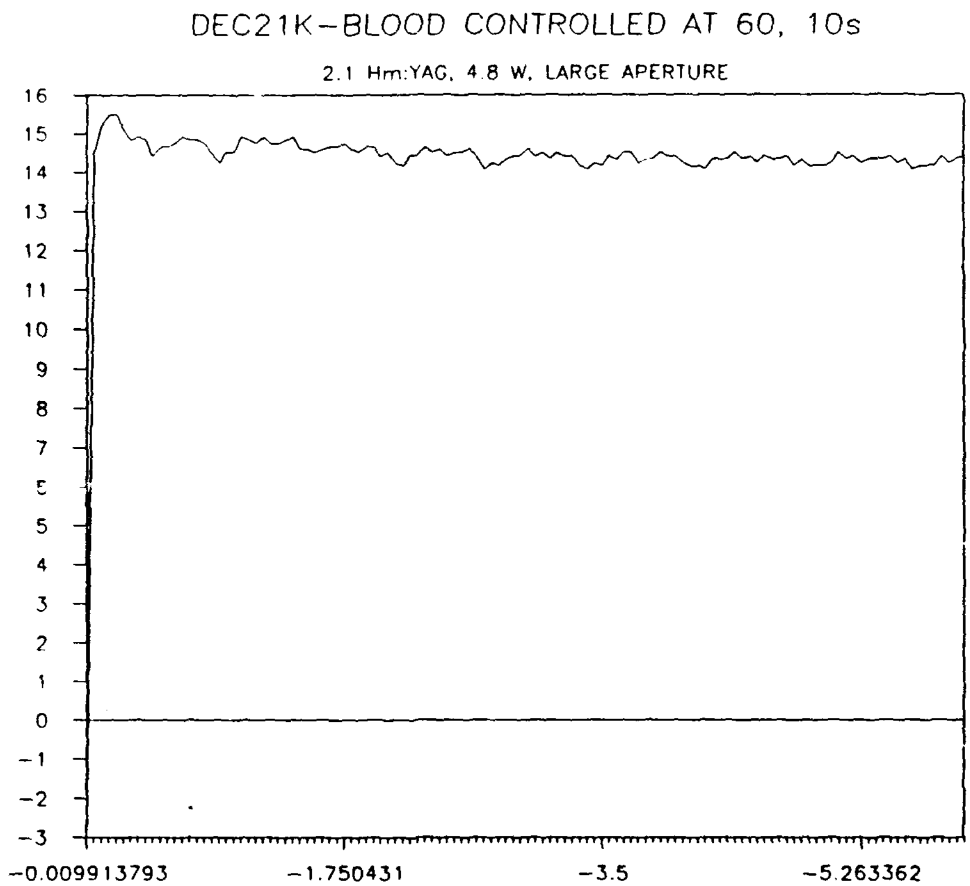

DEC21F-2X ICG CONTROLLED AT 70, 10s
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-0.009913793
-2.480173
-4.981035
-7.488363

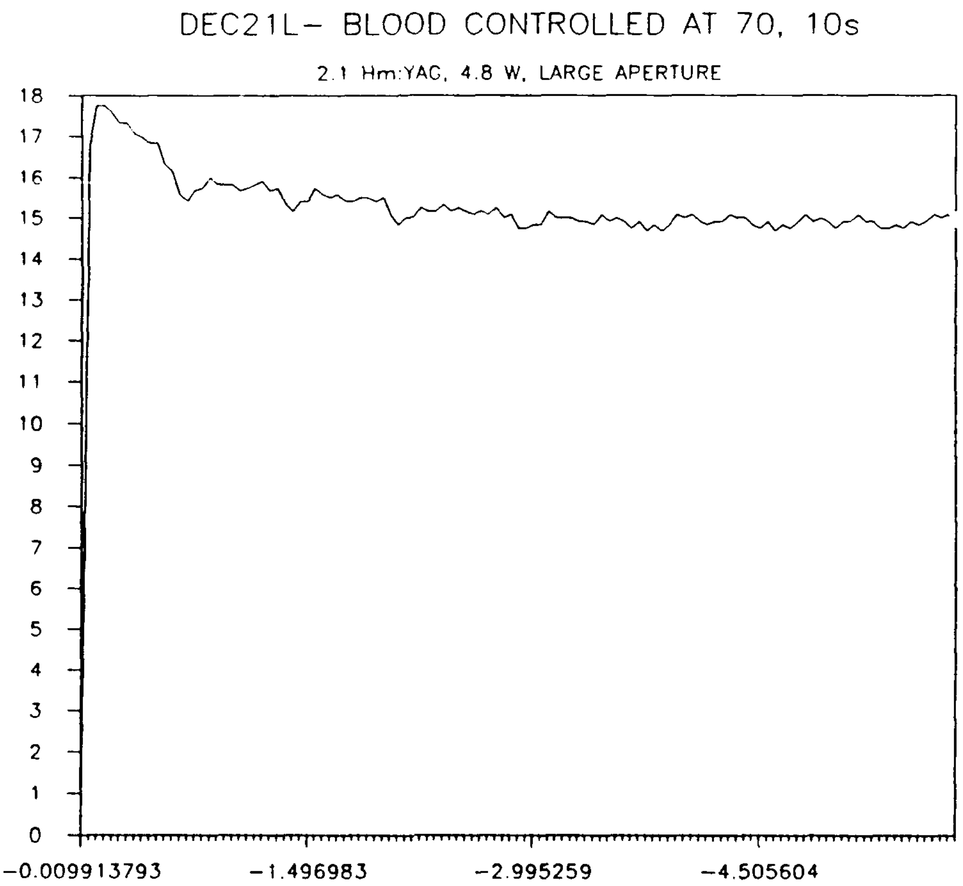

DEC21G-2X ICG CONTROLLED AT 80, 10s
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-0.009913793
-1.489655
-2.981035
-4.481897
-5.985776
-7.489225


DEC21H-2X ICG CONTROLLED AT 100, 10s
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
110
100
90
80
70
60
50
40
30
20
10
-0.009482758
-3.725862
-7.471552
-11.17759
-14.86595
-18.54095


DEC21H-BLOOD UNWELDED CONTROL
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
-0.009482758
-1.491379
-2.985776
-4.49138

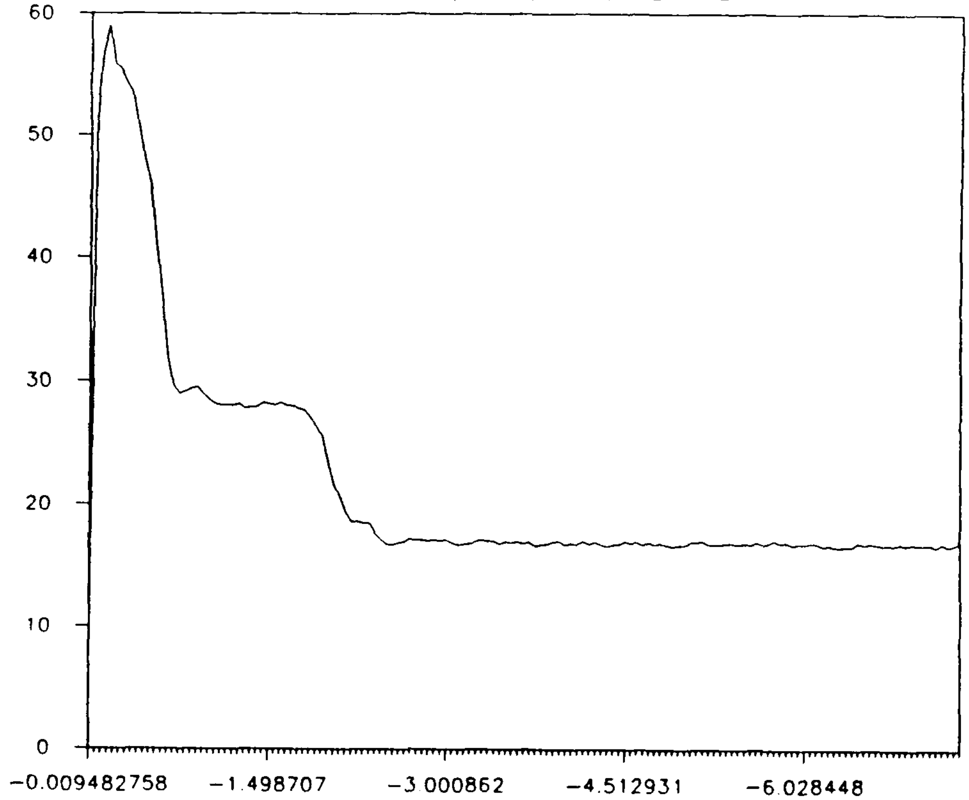

DEC21J-BLOOD CONTROLLED AT 50, 10s
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
16
15
14
13
12
11
10
9
8
7
6
5
4
-0.01422414
-1.505603
-3.005603
-4.516811
-6.032328

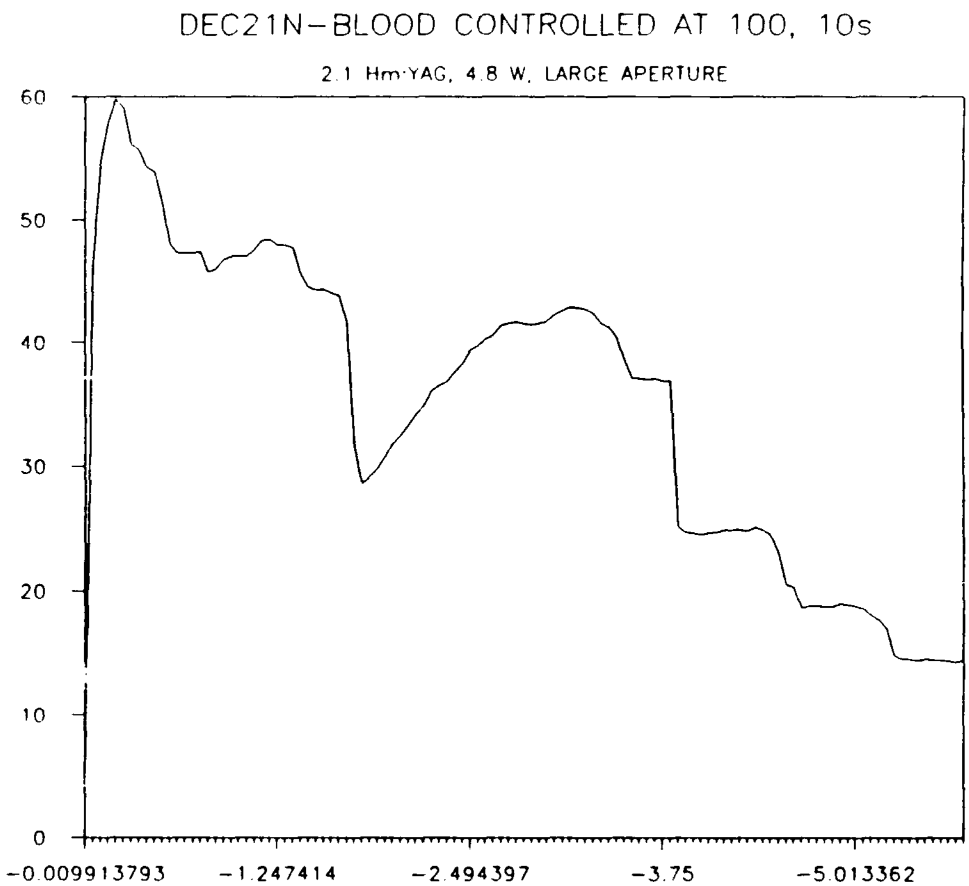



DEC21L- BLOOD CONTROLLED AT 70, 10s
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-0.009913793
-1.496983
-2.995259
-4.505604

DEC21M– BLOOD CONTROLLED AT 80, 10s

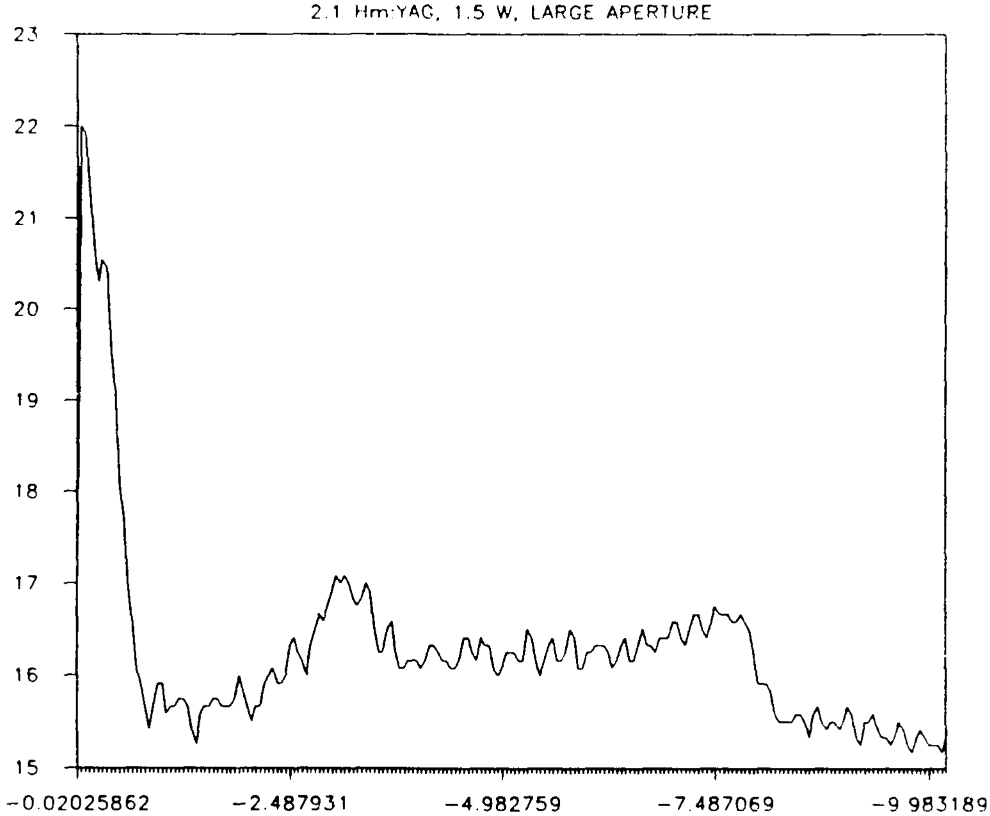
2.1 Hm:YAG, 4.8 W, LARGE APERTURE



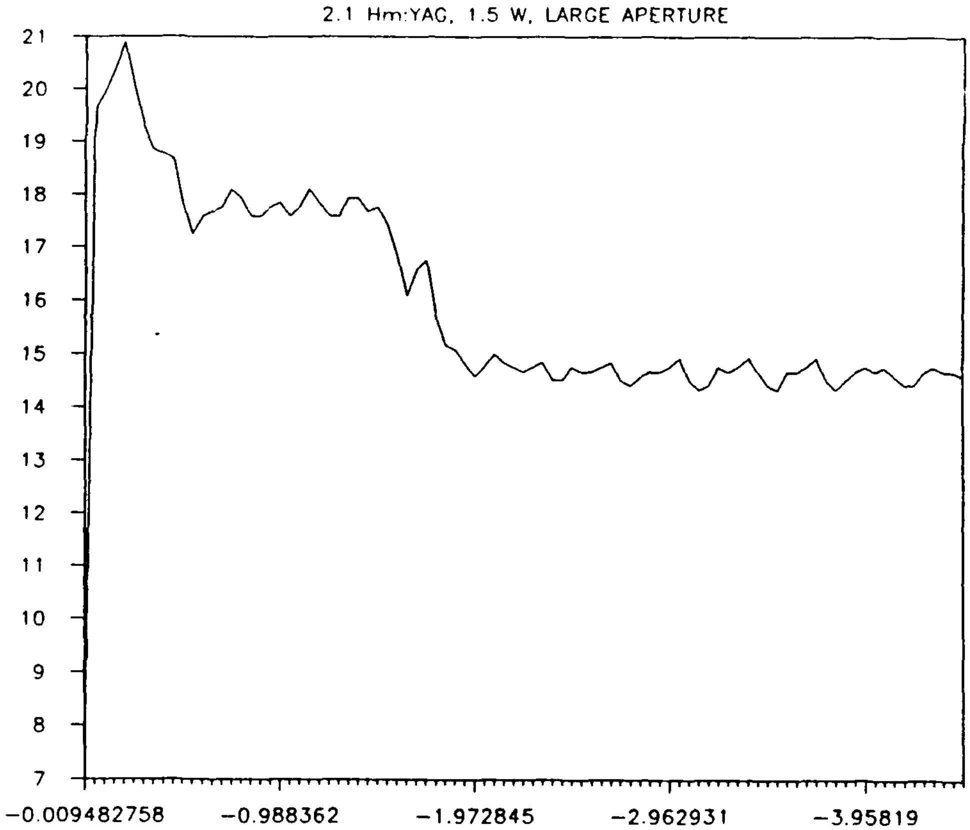

DEC21N-BLOOD CONTROLLED AT 100, 10s
2.1 Hm:YAG, 4.8 W, LARGE APERTURE
60
50
40
30
20
10
0
-0.009913793
-1.247414
-2.494397
-3.75
-5.013362

DEC2101-BLOOD CONTROLLED AT 50, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE

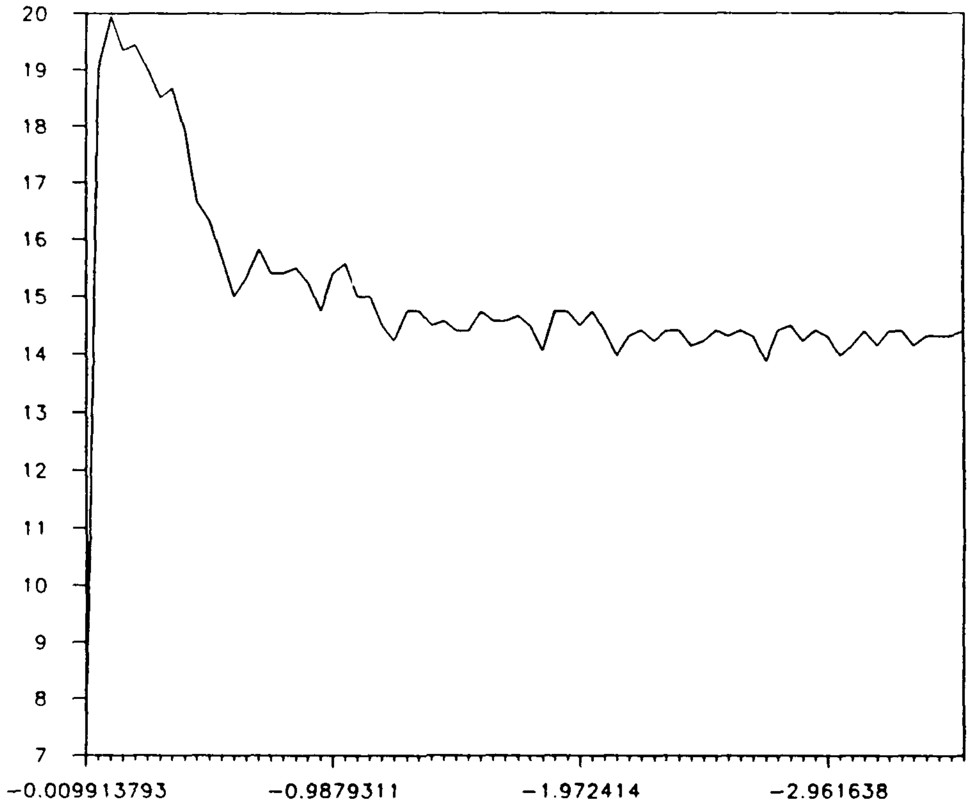


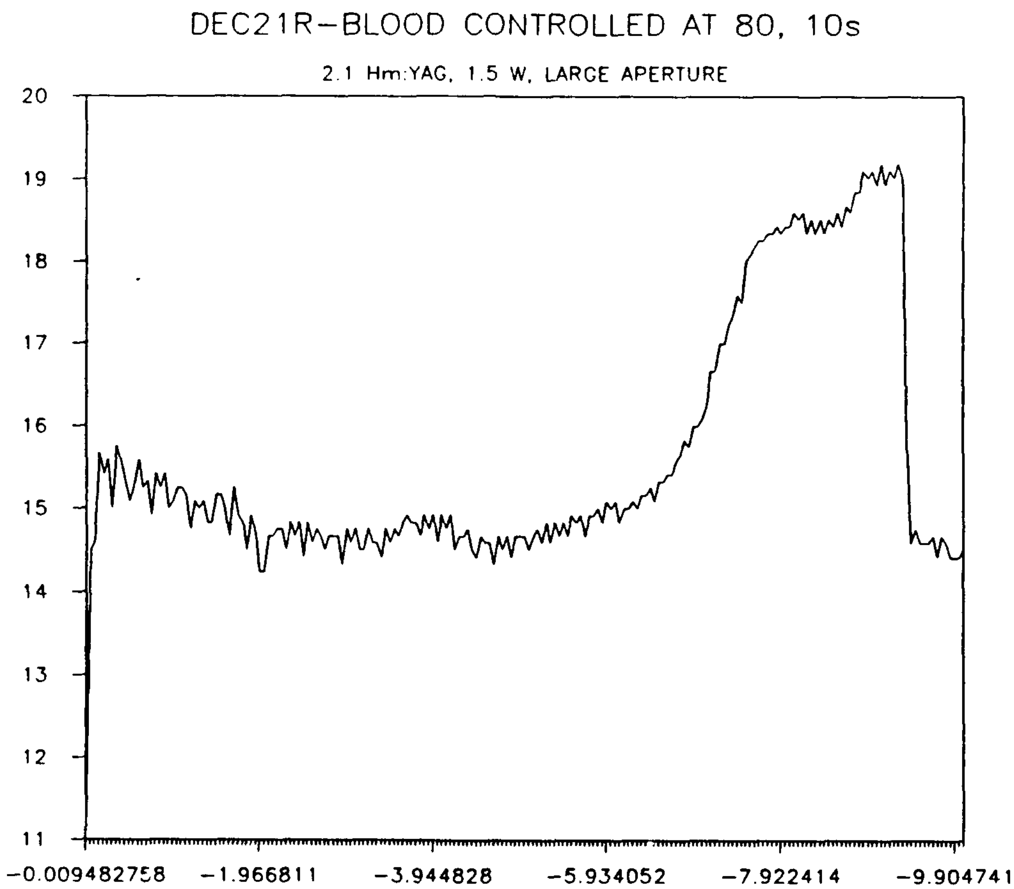
DEC21P—BLOOD CONTROLLED AT 60, 10s



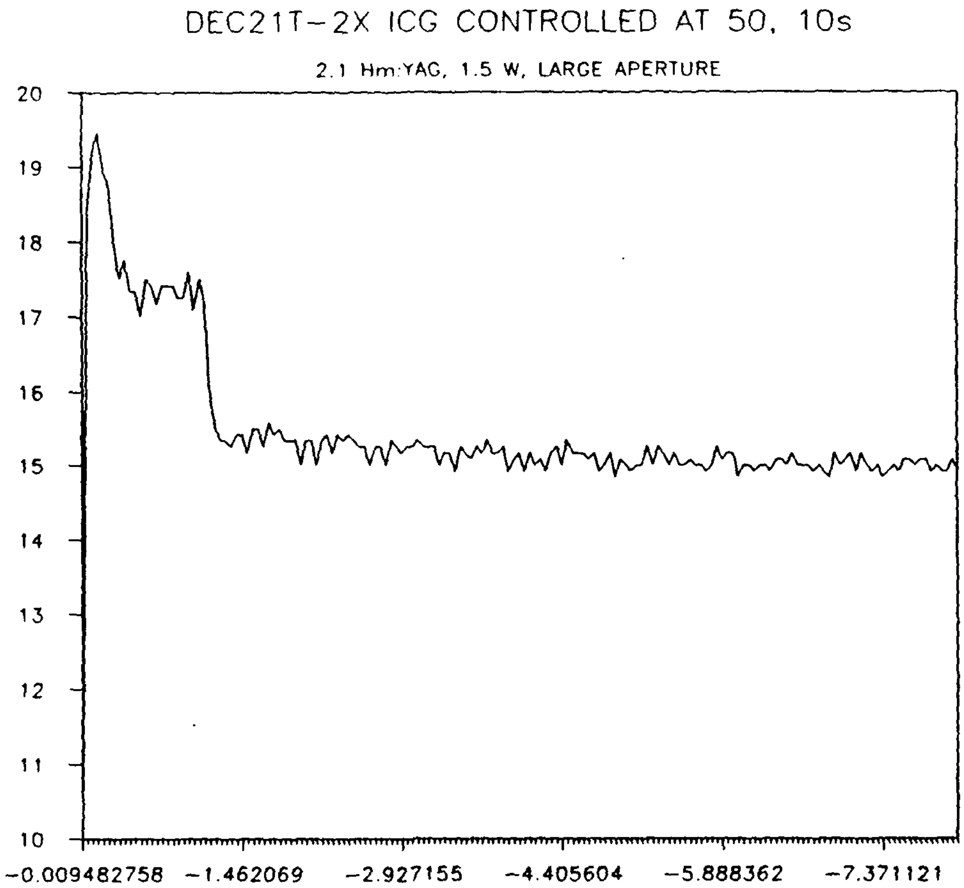
DEC21Q-BLOOD CONTROLLED AT 70, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



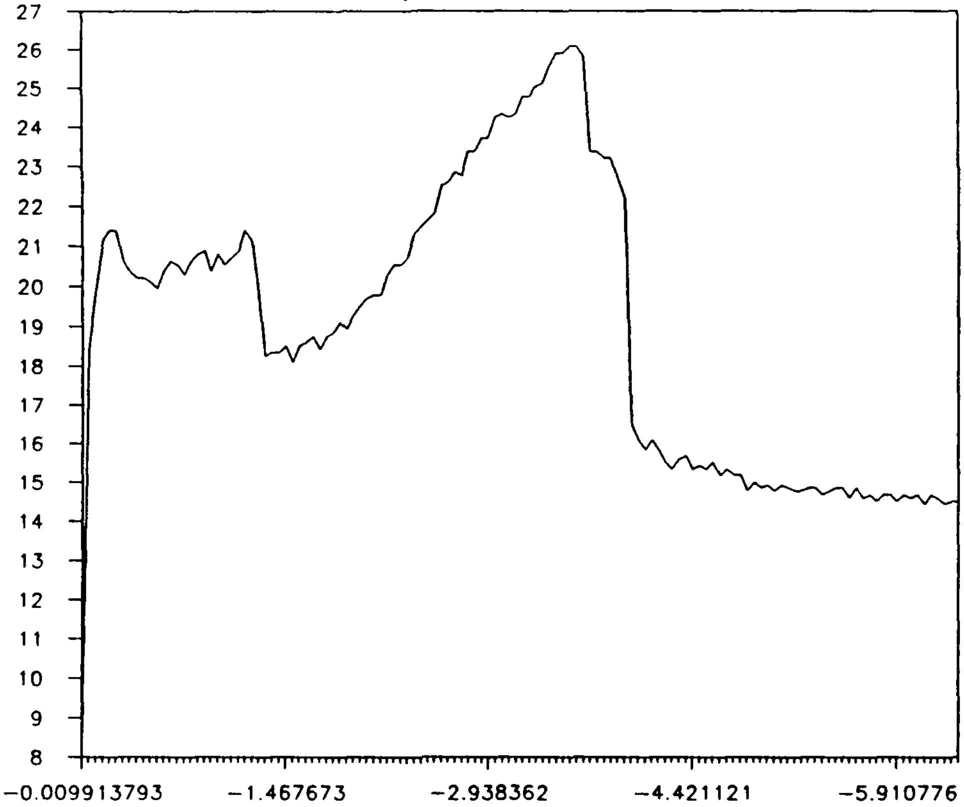


DEC21R–BLOOD CONTROLLED AT 80, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
20
19
18
17
16
15
14
13
12
11
−0.009482758
−1.966811
−3.944828
−5.934052
−7.922414
−9.904741


DEC21T-2X ICG CONTROLLED AT 50, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
20
19
18
17
16
15
14
13
12
11
10
-0.009482758
-1.462069
-2.927155
-4.405604
-5.888362
-7.371121

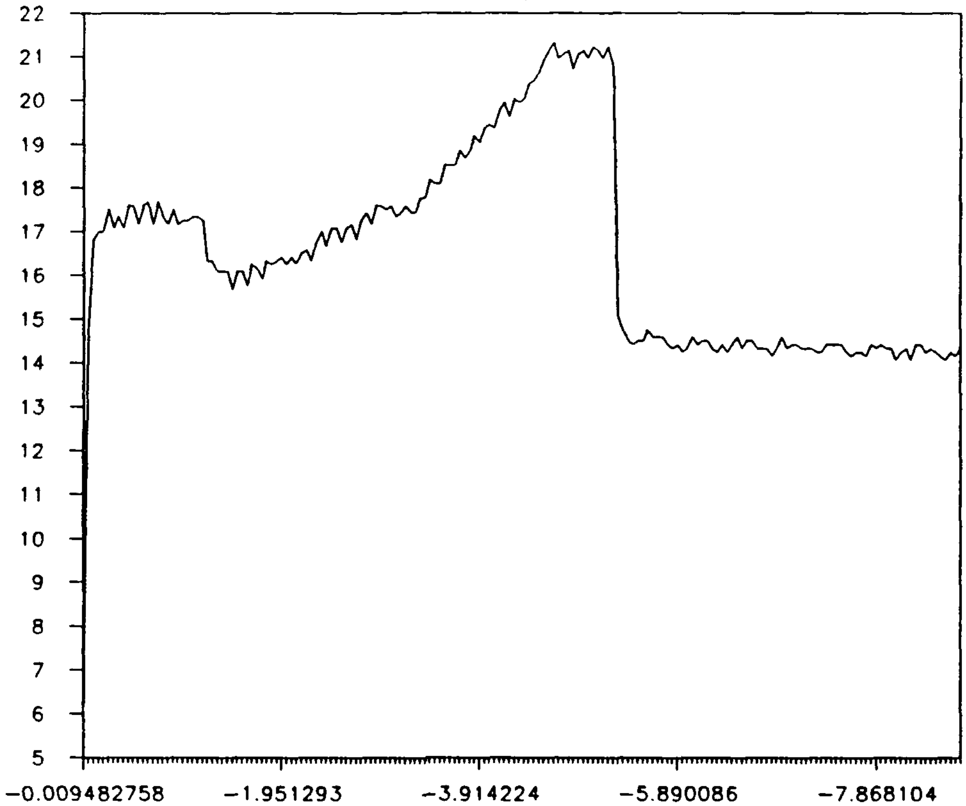
DEC21S-BLOOD CONTROLLED AT 100, 10s

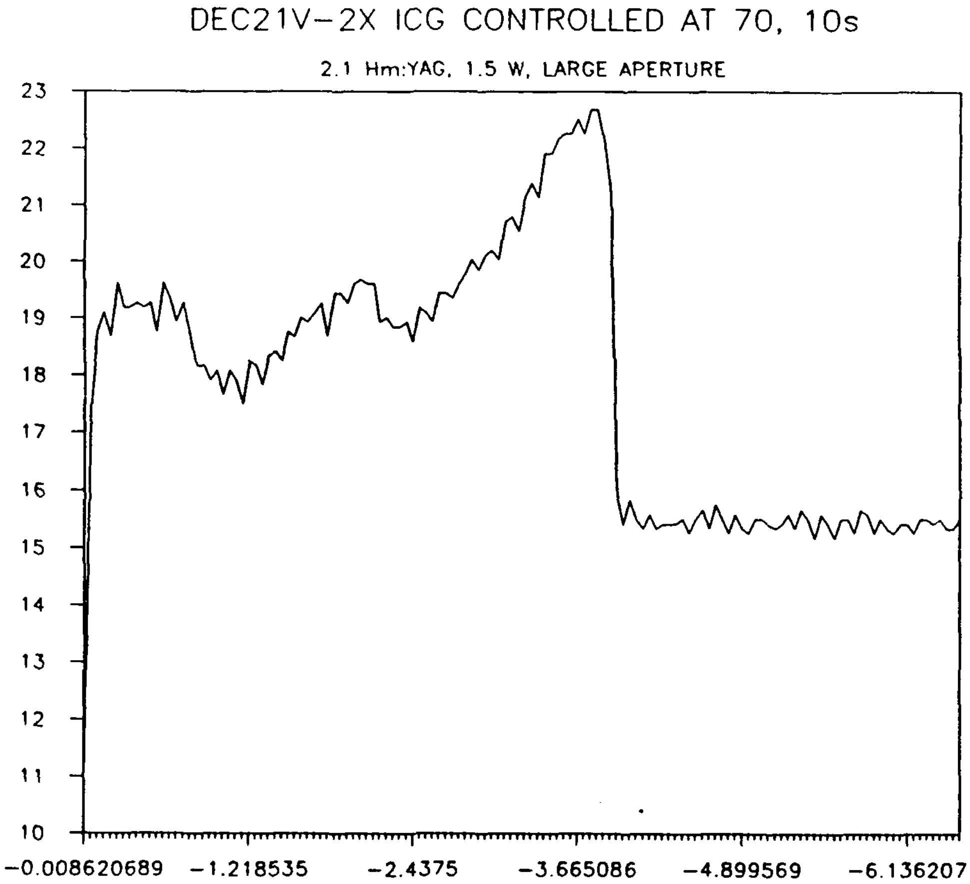
2.1 Hm:yAG, 1.5 W, LARGE APERTURE

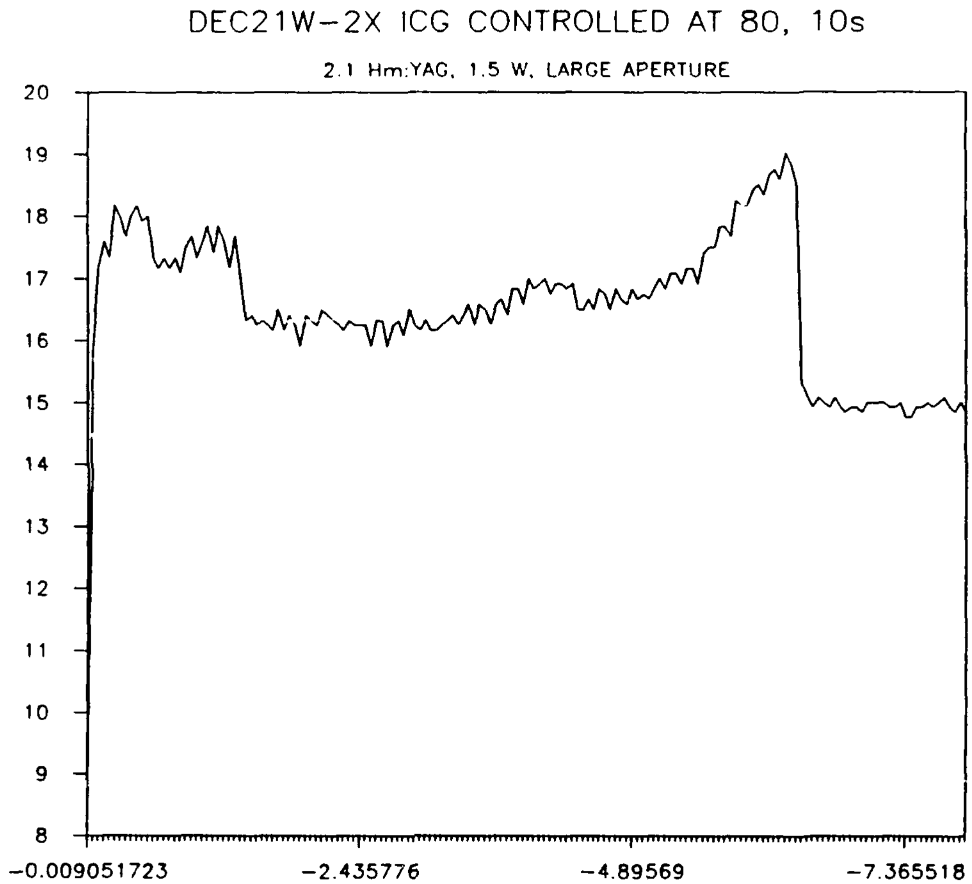


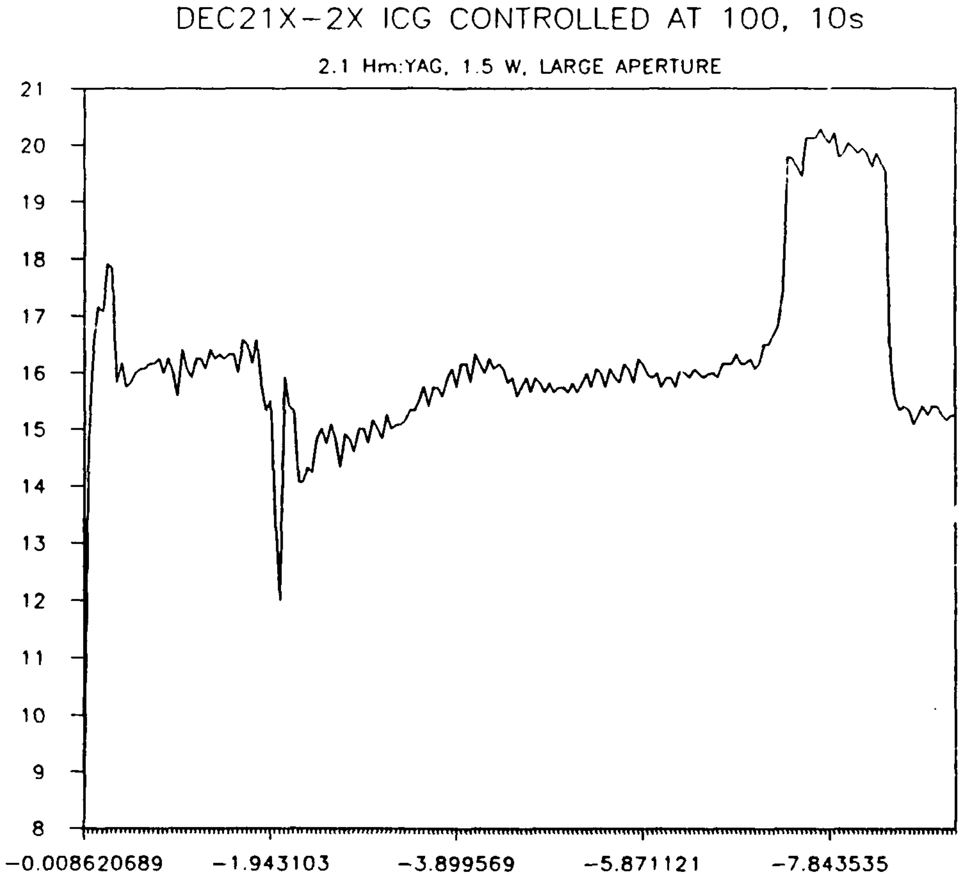
DEC21U-2X ICG CONTROLLED AT 60, 10s

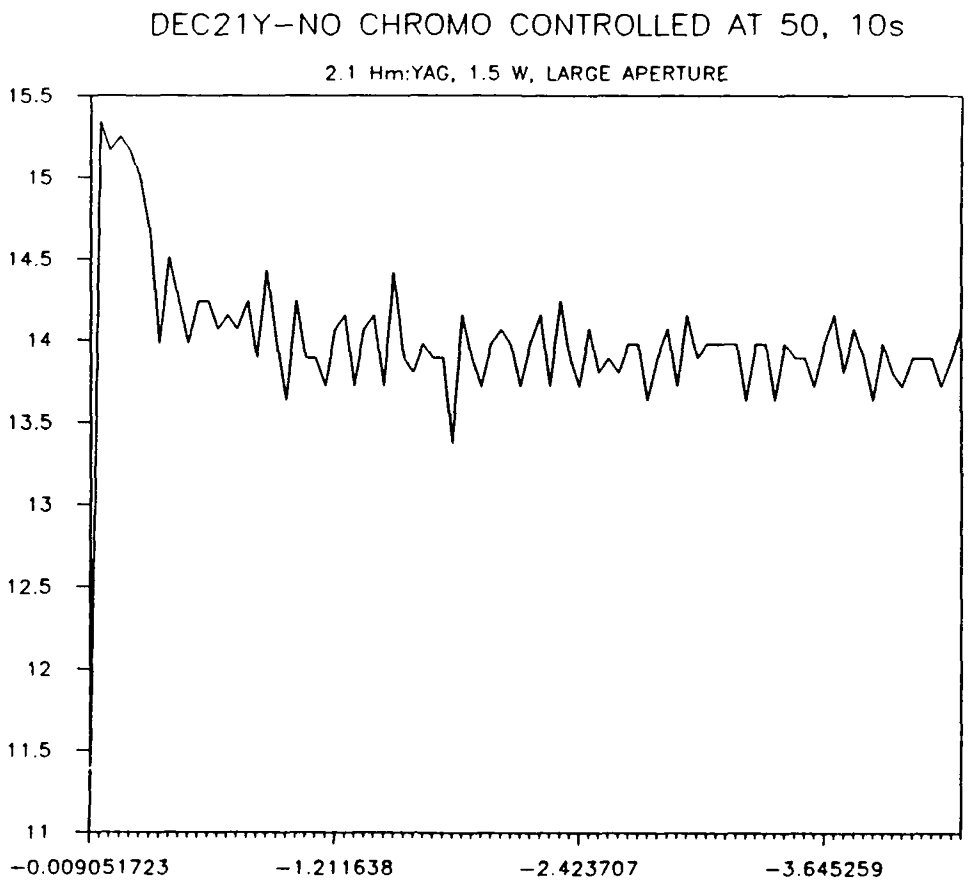
2.1 Hm:YAG, 1.5 W, LARGE APERTURE




DEC21V-2X ICG CONTROLLED AT 70, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
23
22
21
20
19
18
17
16
15
14
13
12
11
10
-0.008620689
-1.218535
-2.4375
-3.665086
-4.899569
-6.136207

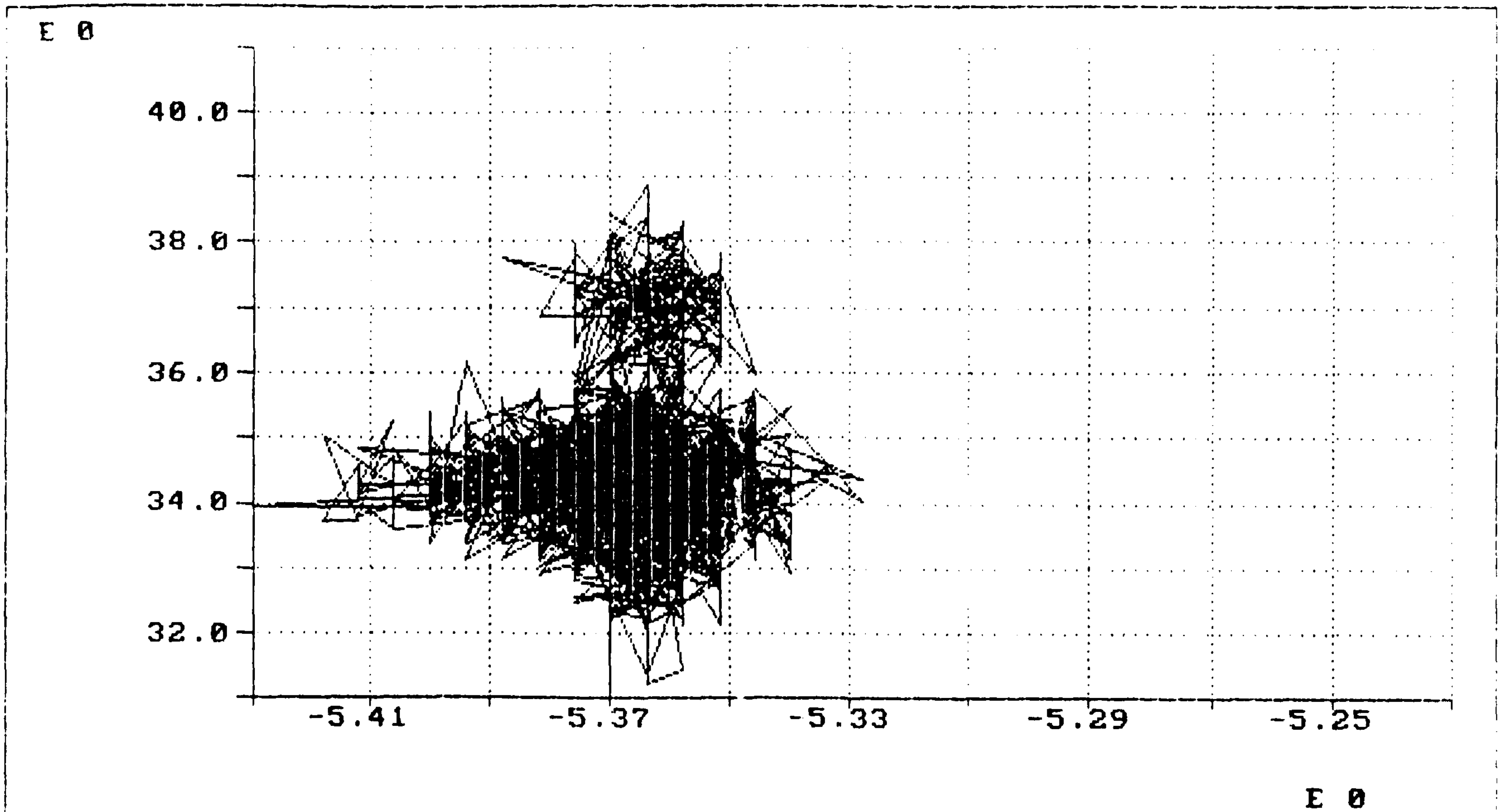

DEC21W-2X ICG CONTROLLED AT 80, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
20
19
18
17
16
15
14
13
12
11
10
9
8
-0.009051723
-2.435776
-4.89569
-7.365518


DEC21X-2X ICG CONTROLLED AT 100, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
21
20
19
18
17
16
15
14
13
12
11
10
9
8
-0.008620689
-1.943103
-3.899569
-5.871121
-7.843535

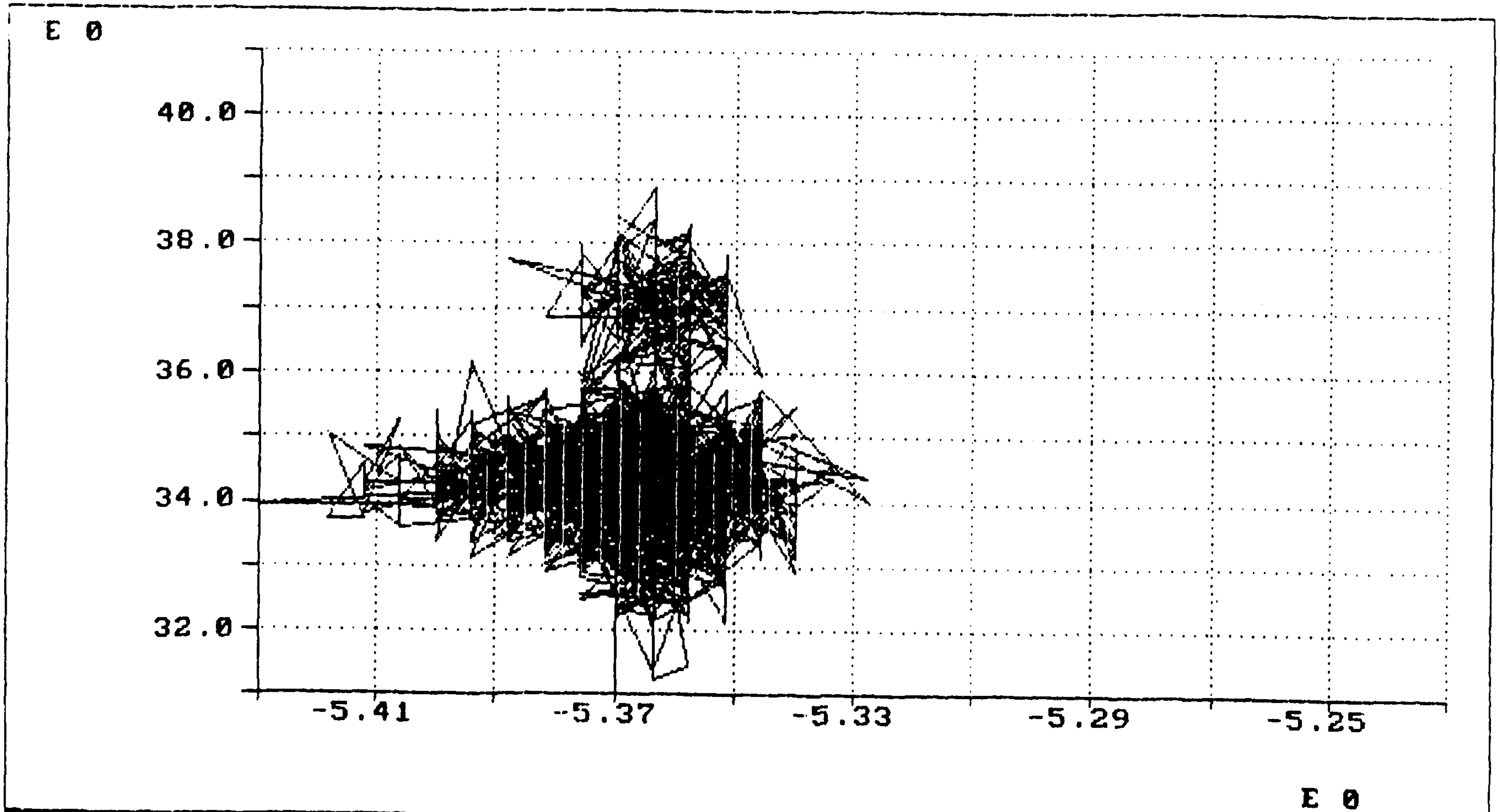


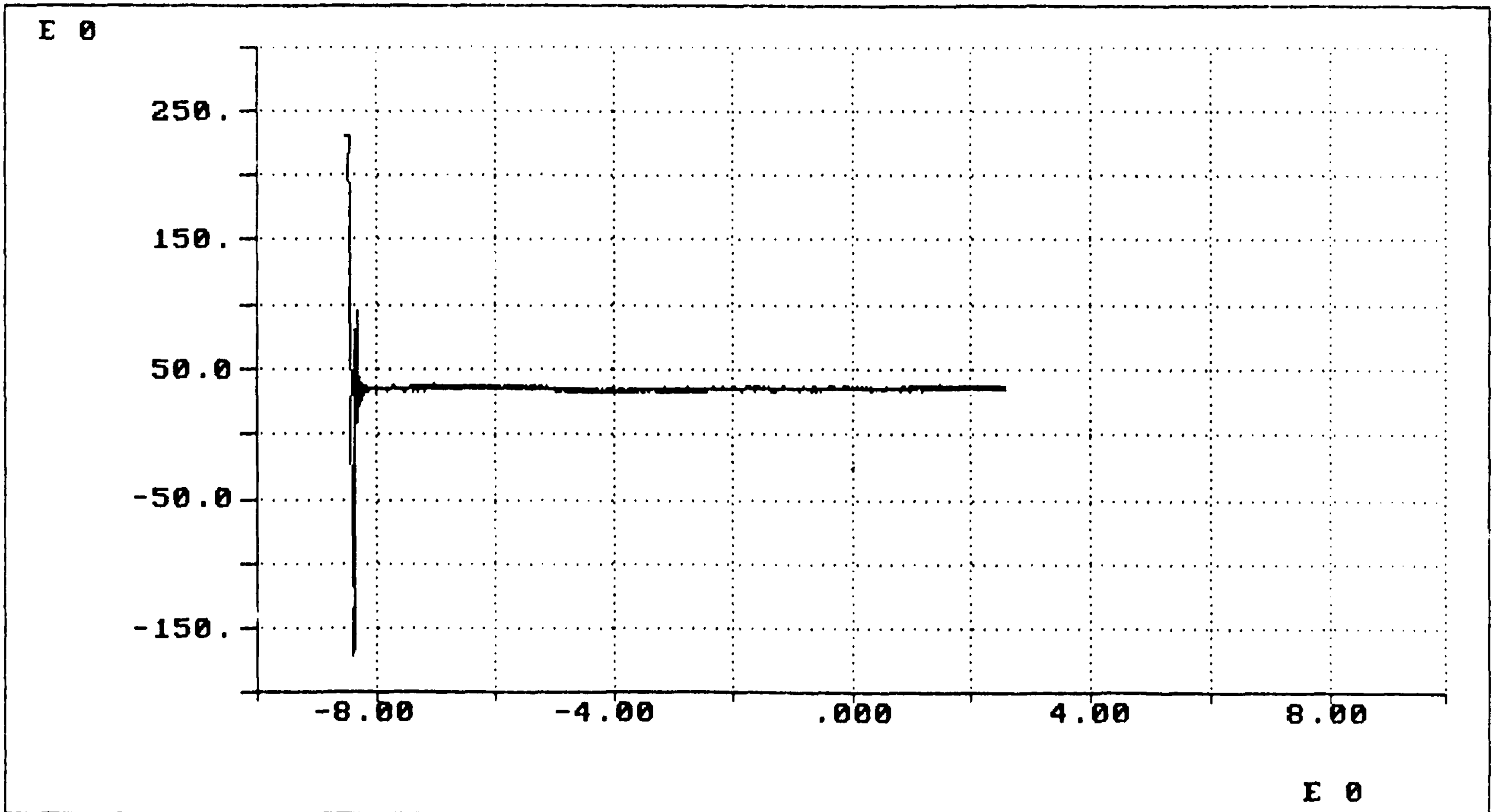
DEC21Y-NO CHROMO CONTROLLED AT 50, 10s
2.1 Hm:YAG, 1.5 W, LARGE APERTURE
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
-0.009051723
-1.211638
-2.423707
-3.645259

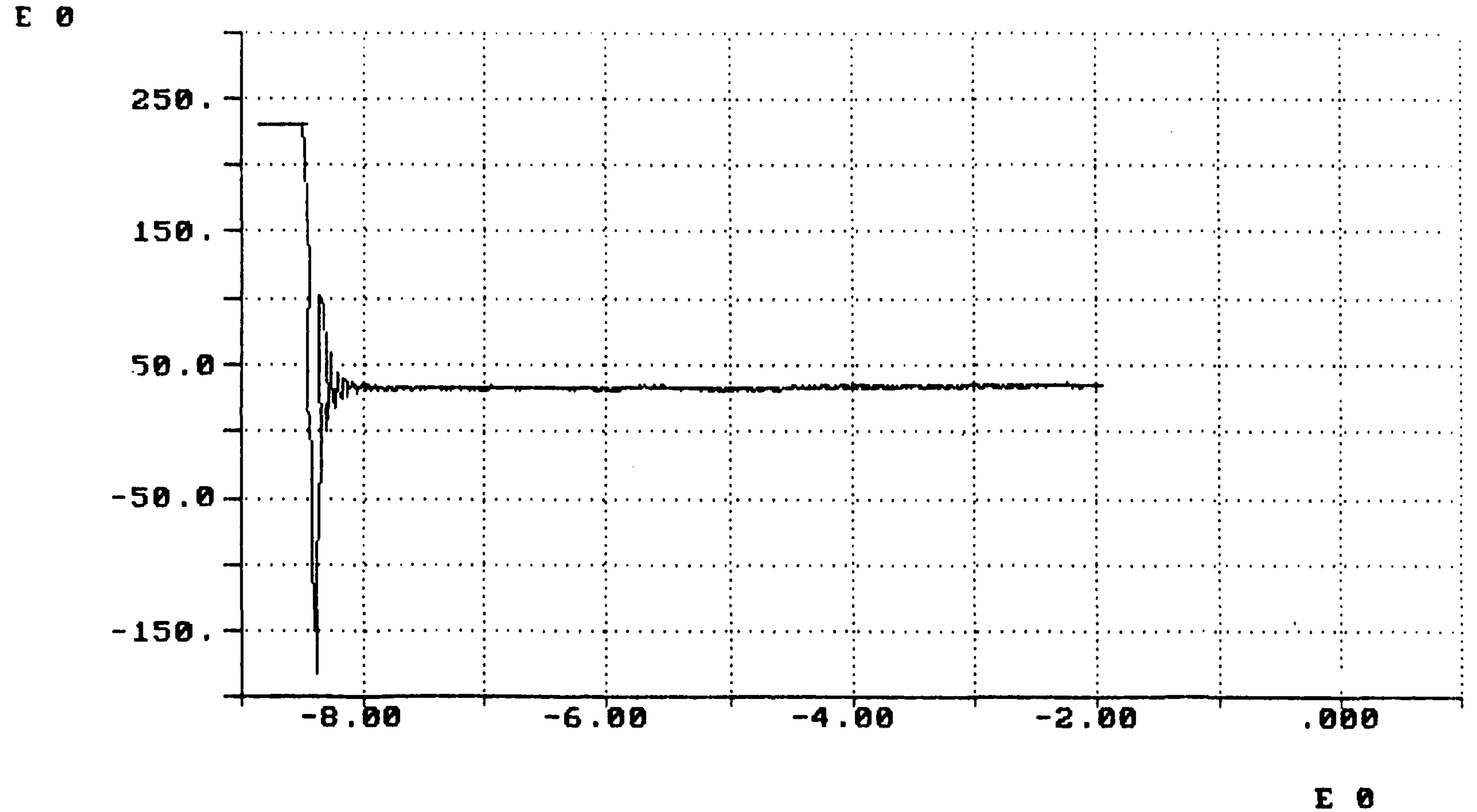
Appendix B- Excluded Data


E 0
40.0
38.0
36.0
34.0
32.0
-5.41
-5.37
-5.33
-5.29
-5.25
E 0

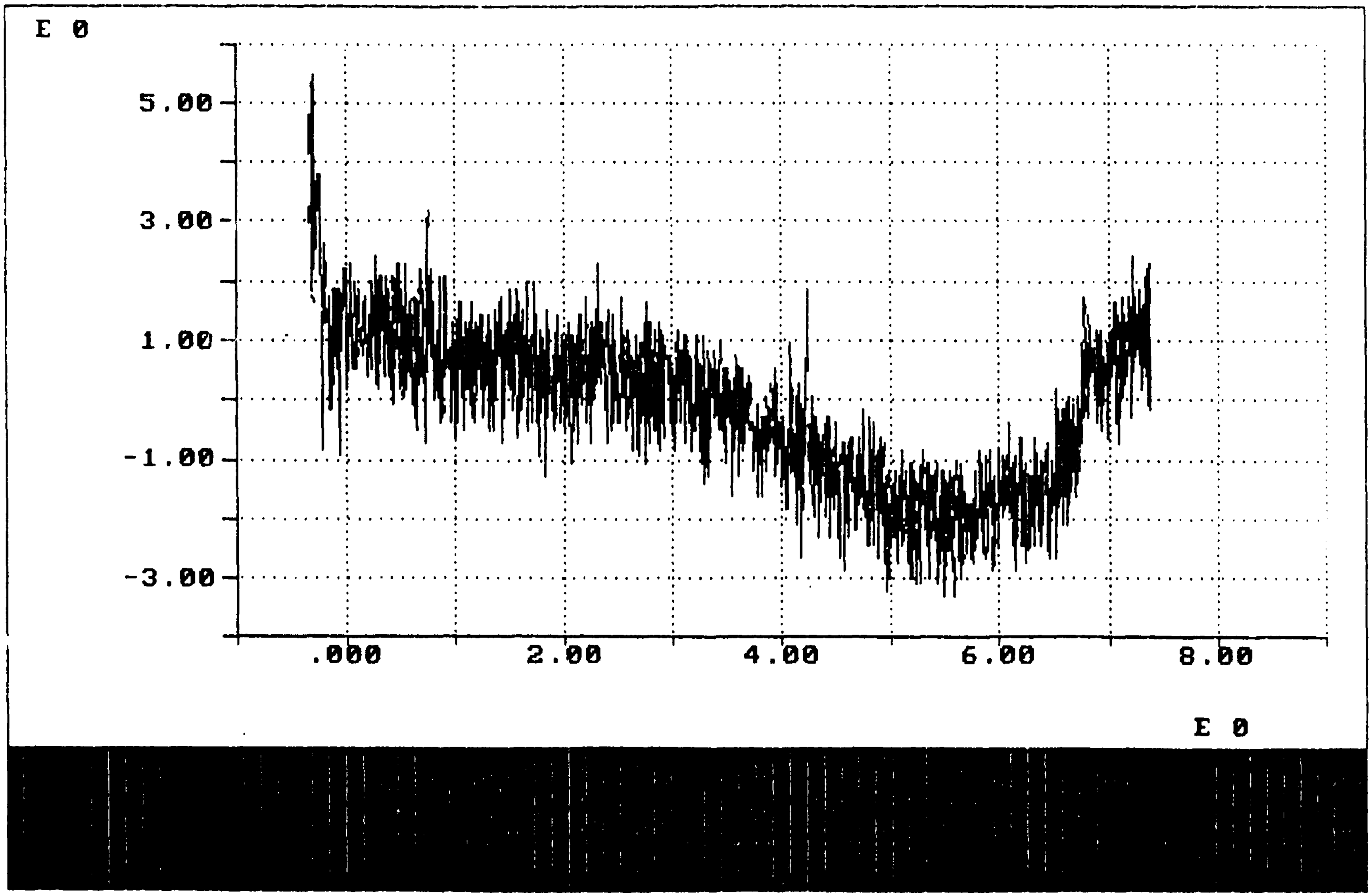
Jul 306

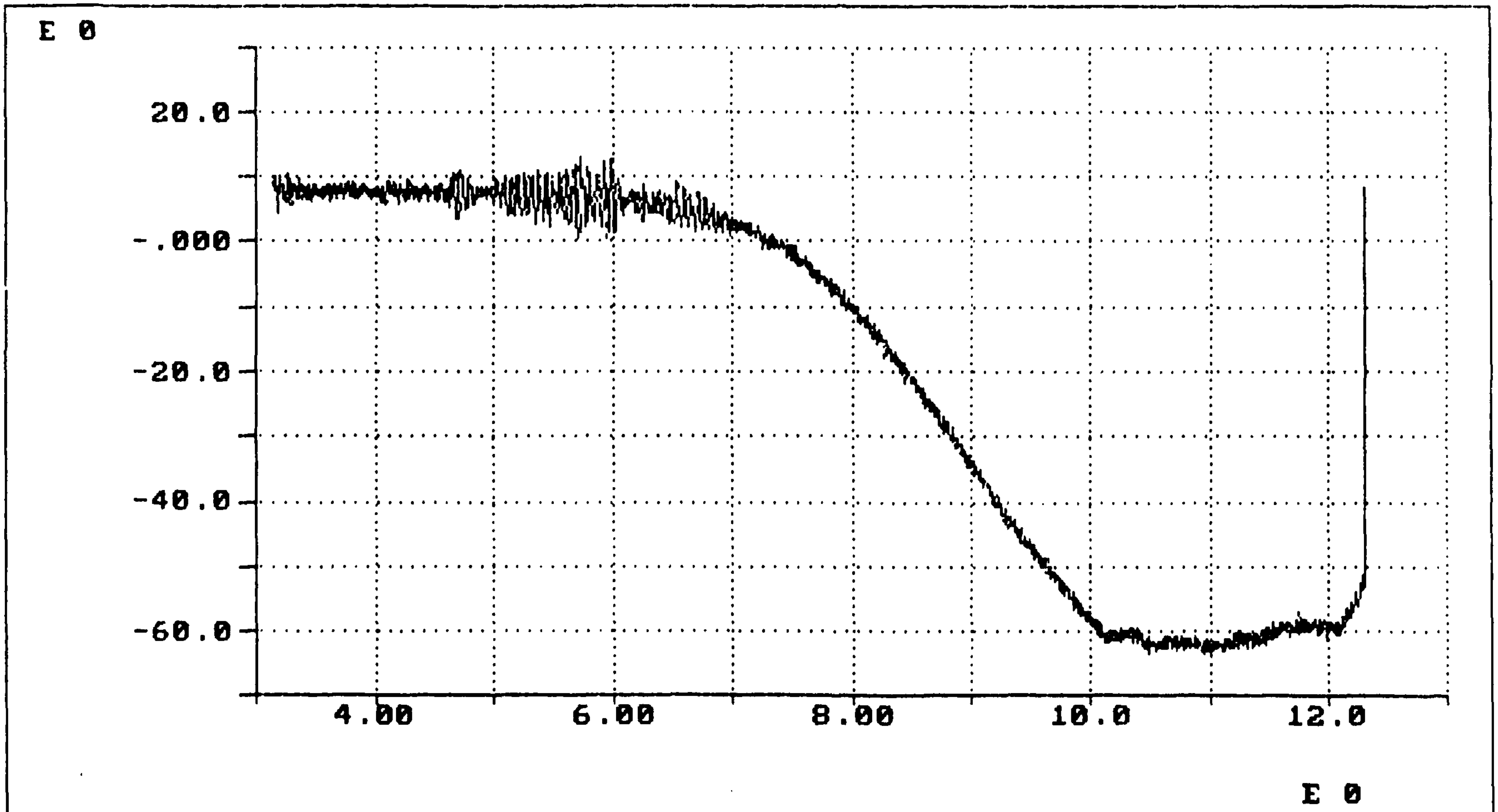


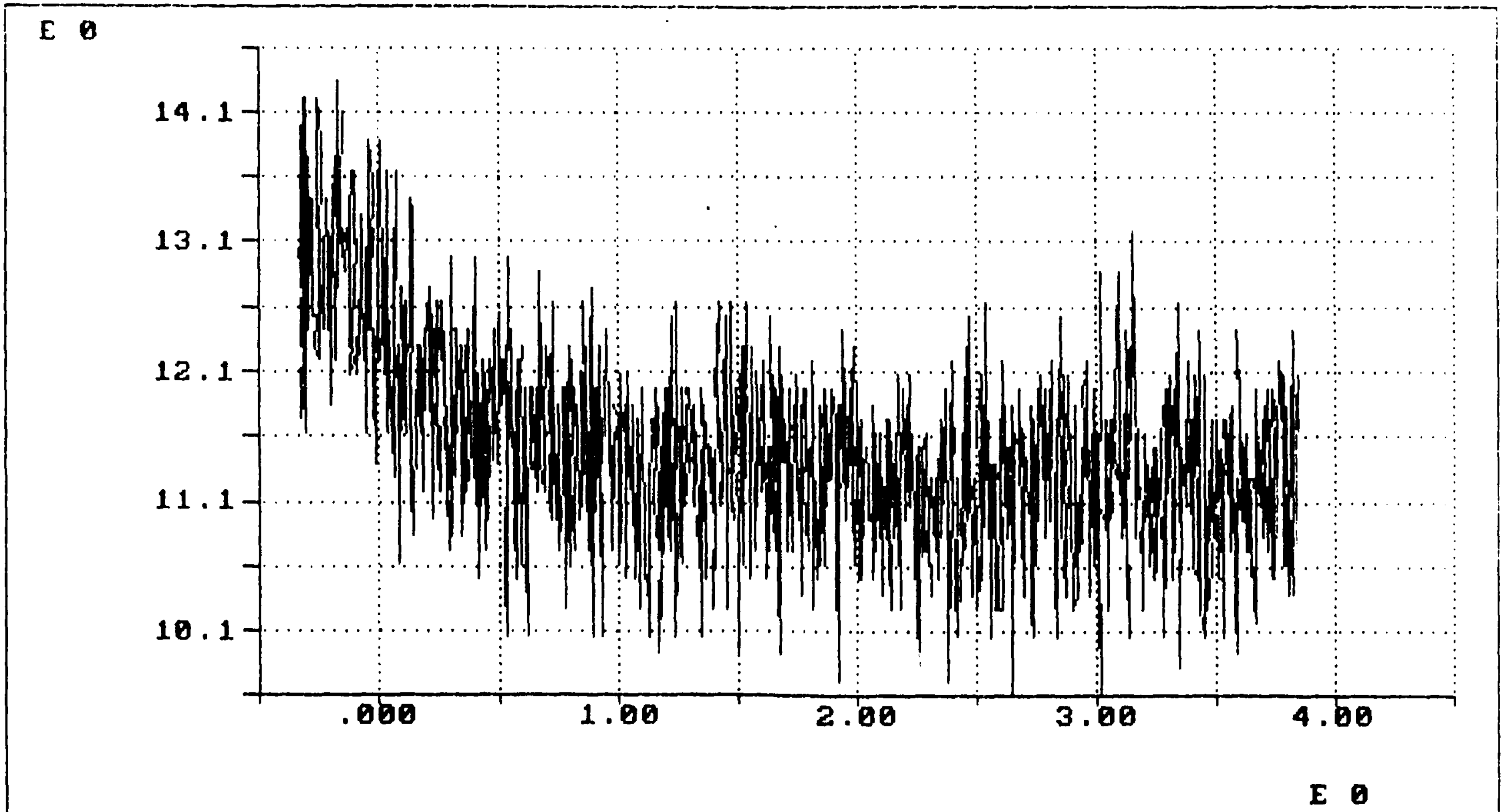

E 0
250.
150.
50.0
-50.0
-150.
-8.00
-4.00
.000
4.00
8.00
E 0

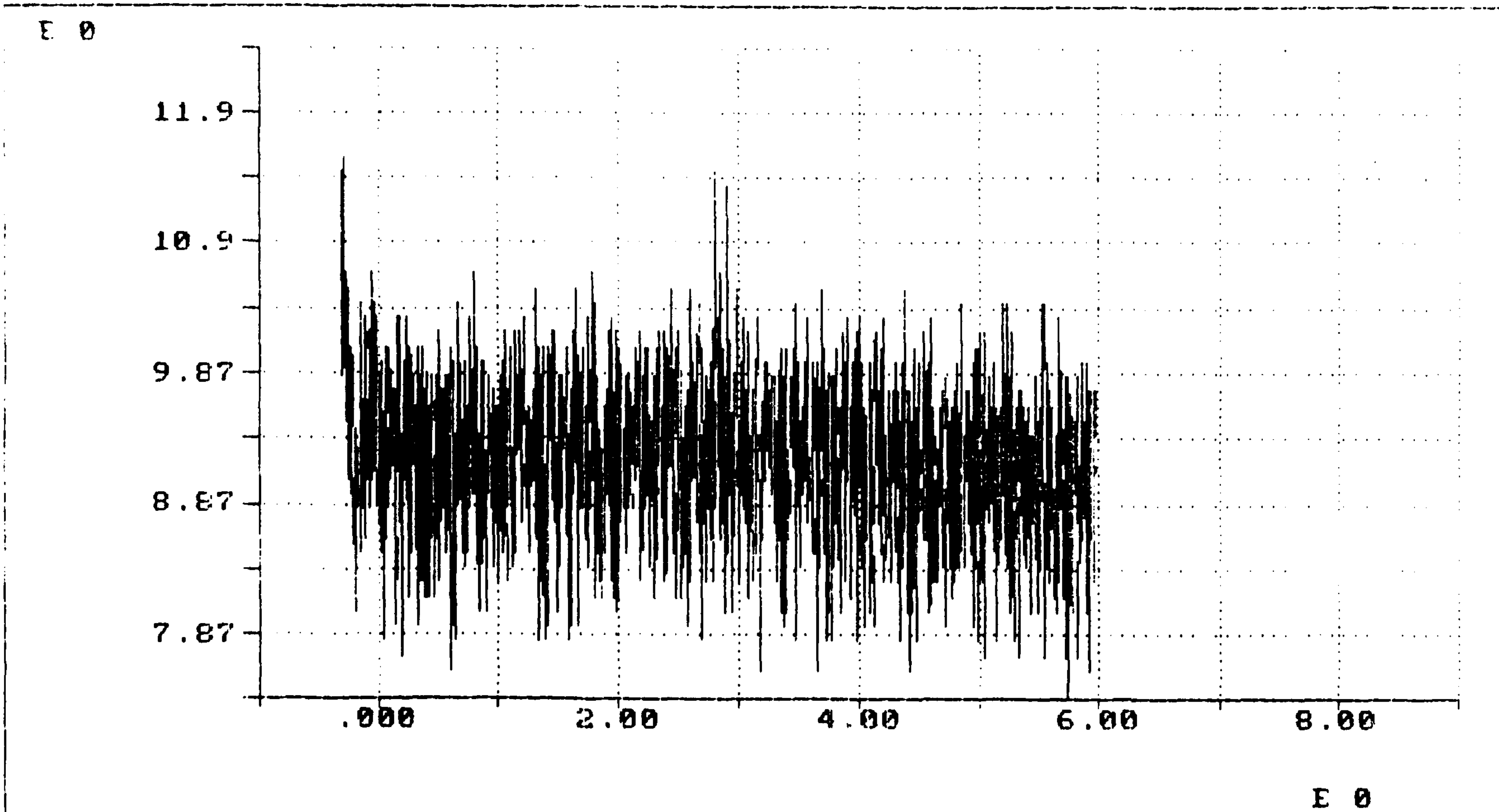


E 0
250.
150.
50.0
-50.0
-150.
-8.00
-6.00
-4.00
-2.00
.000
E 0


E 0
5.00
3.00
1.00
-1.00
-3.00
.000
2.00
4.00
6.00
8.00
E 0


E 0
20.0
-.000
-20.0
-40.0
-60.0
4.00
6.00
8.00
10.0
12.0
E 0


E 0
14.1
13.1
12.1
11.1
10.1
.000
1.00
2.00
3.00
4.00
E 0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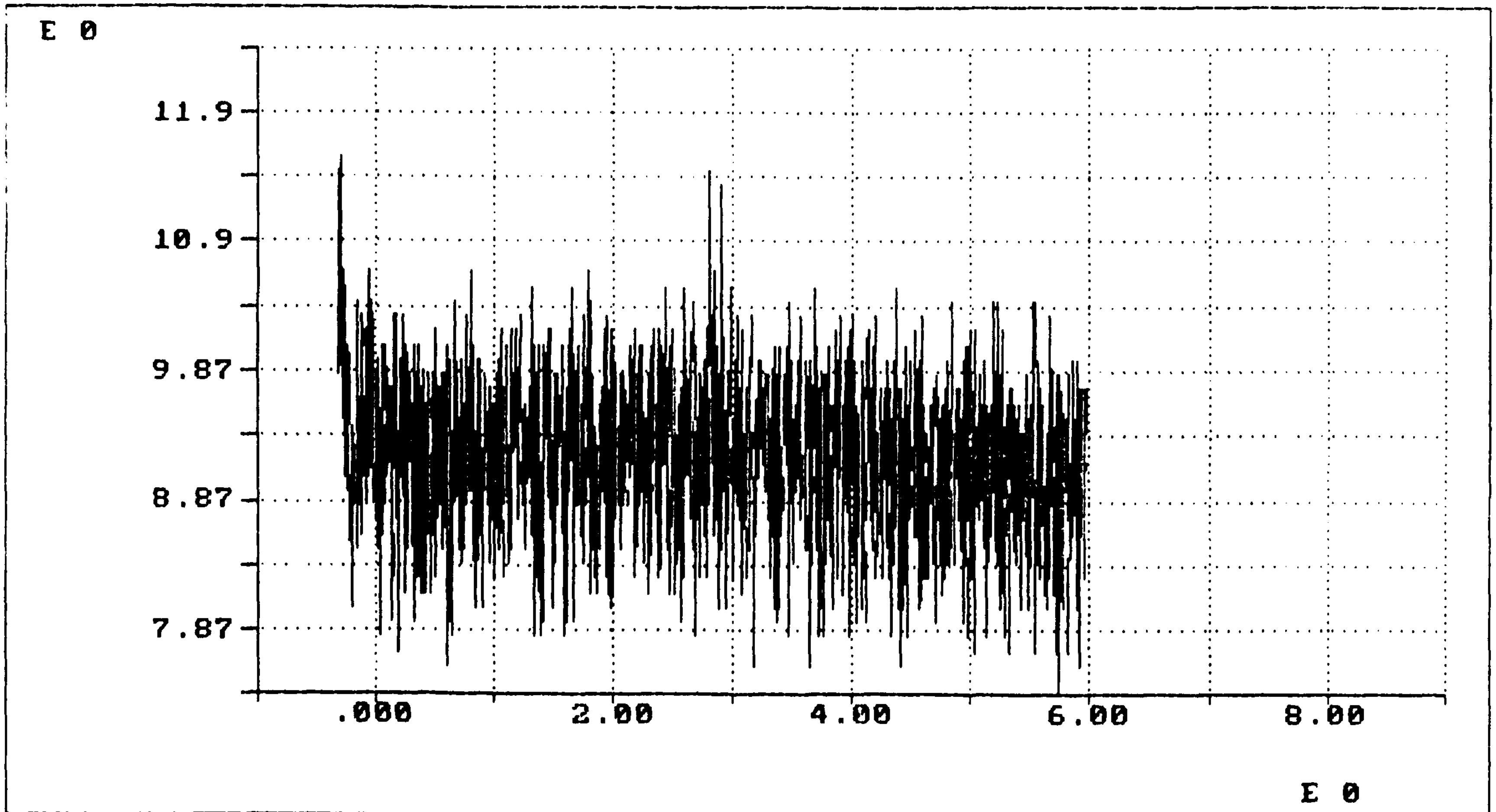
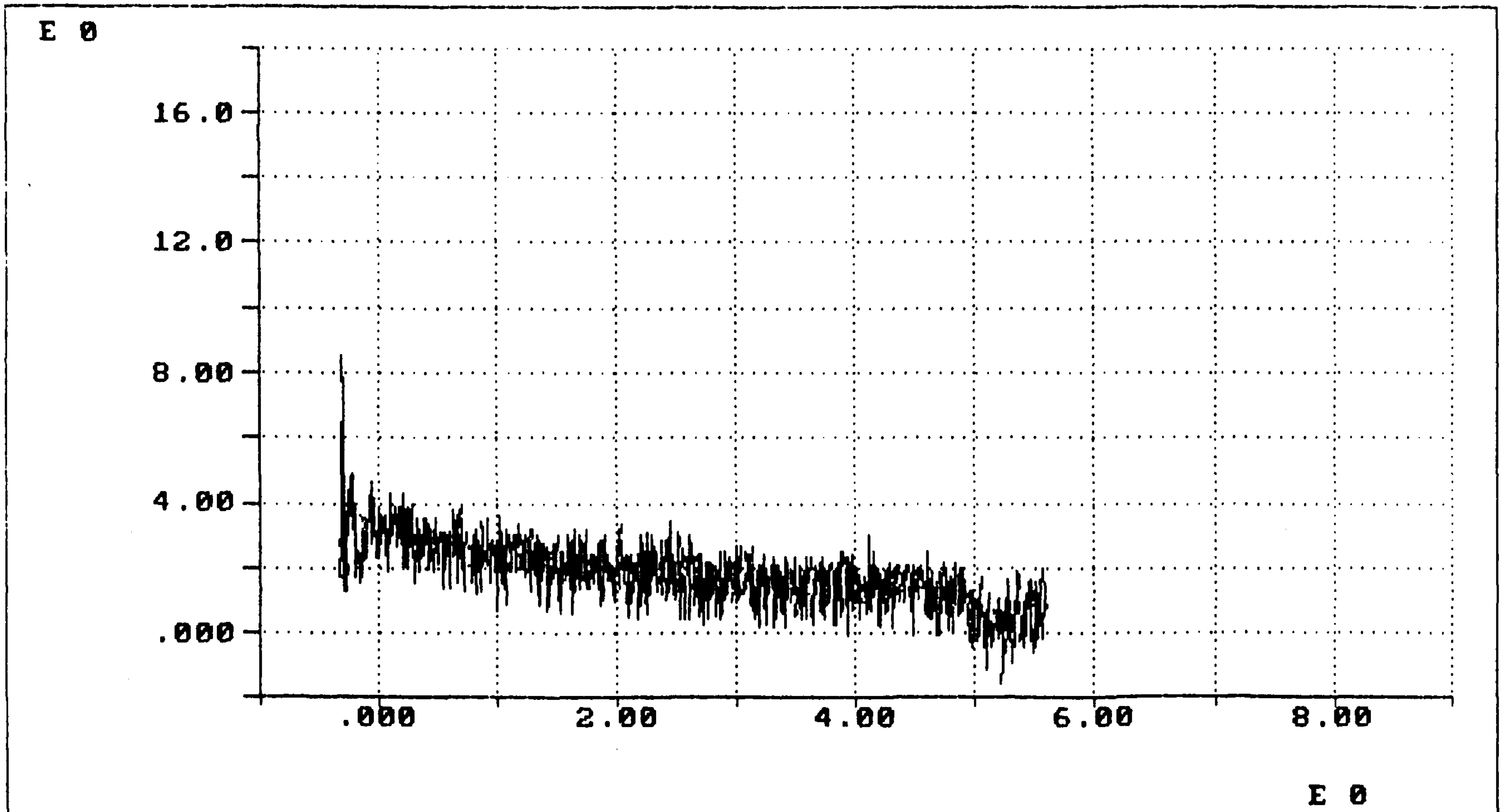
10.9
9.87
8.87
7.87
.000
2.00
4.00
6.00
8.00
E 0

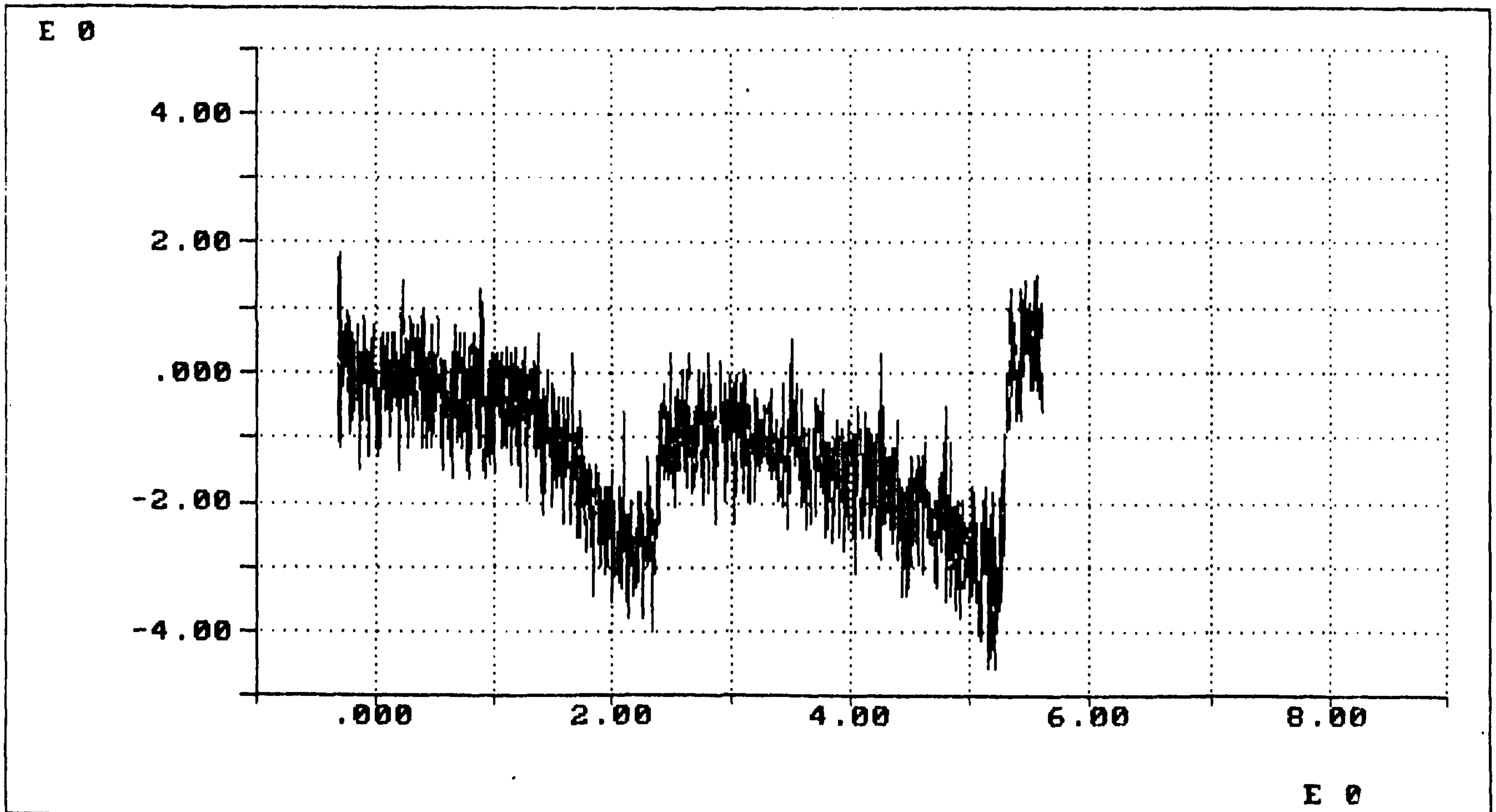
Jul 27 0



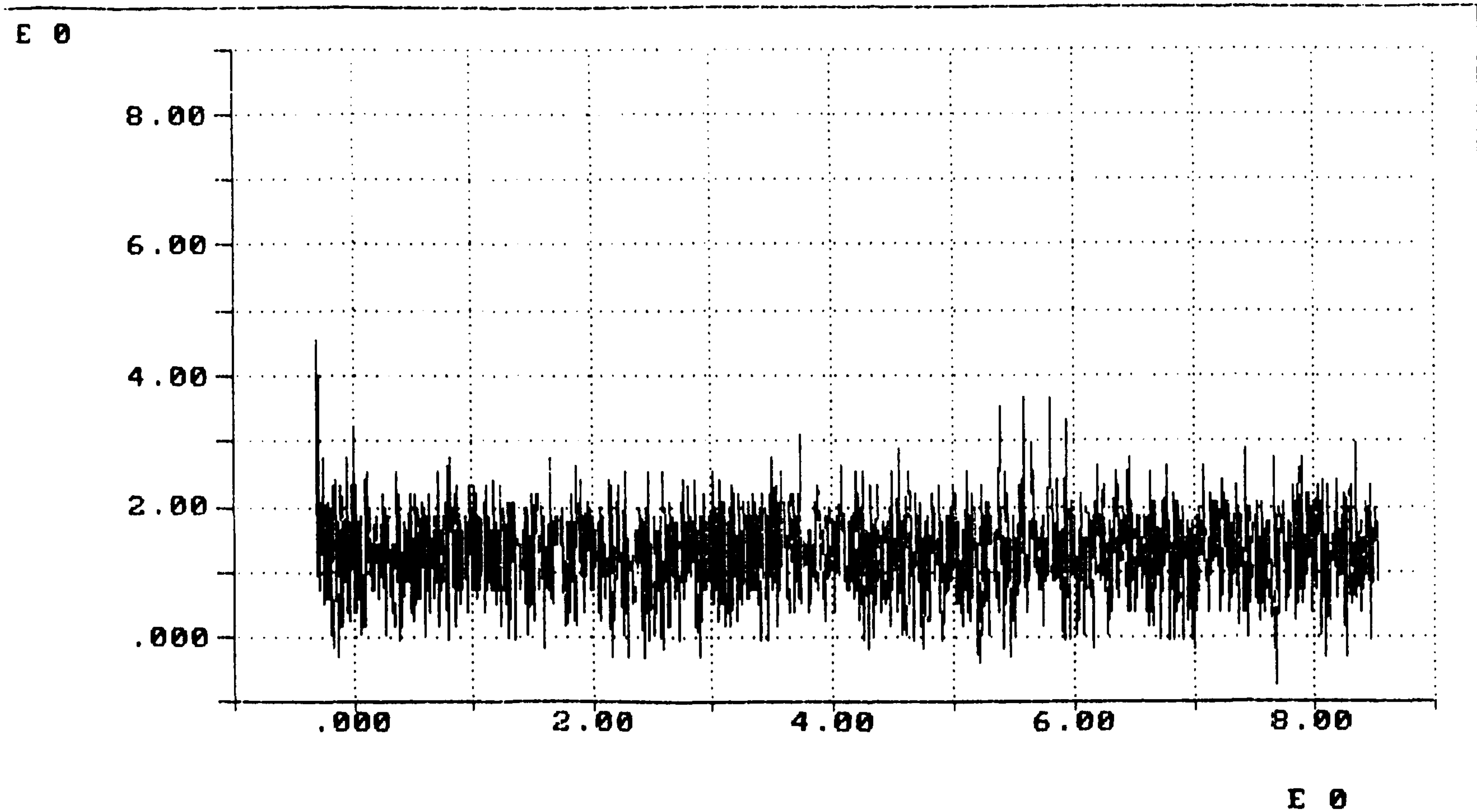
Jul 97 I

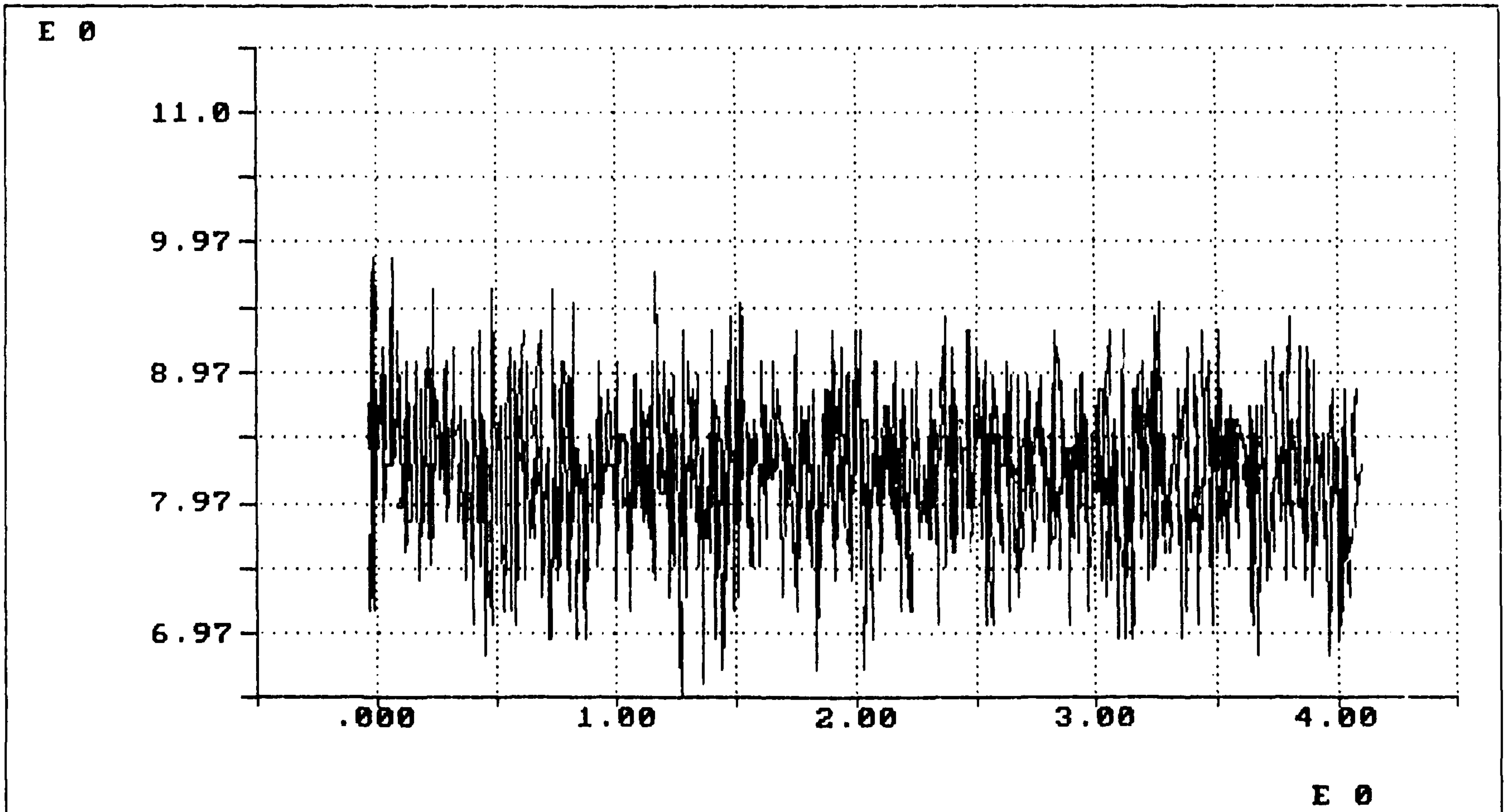


Jul 27 5



Jul 37 (3)

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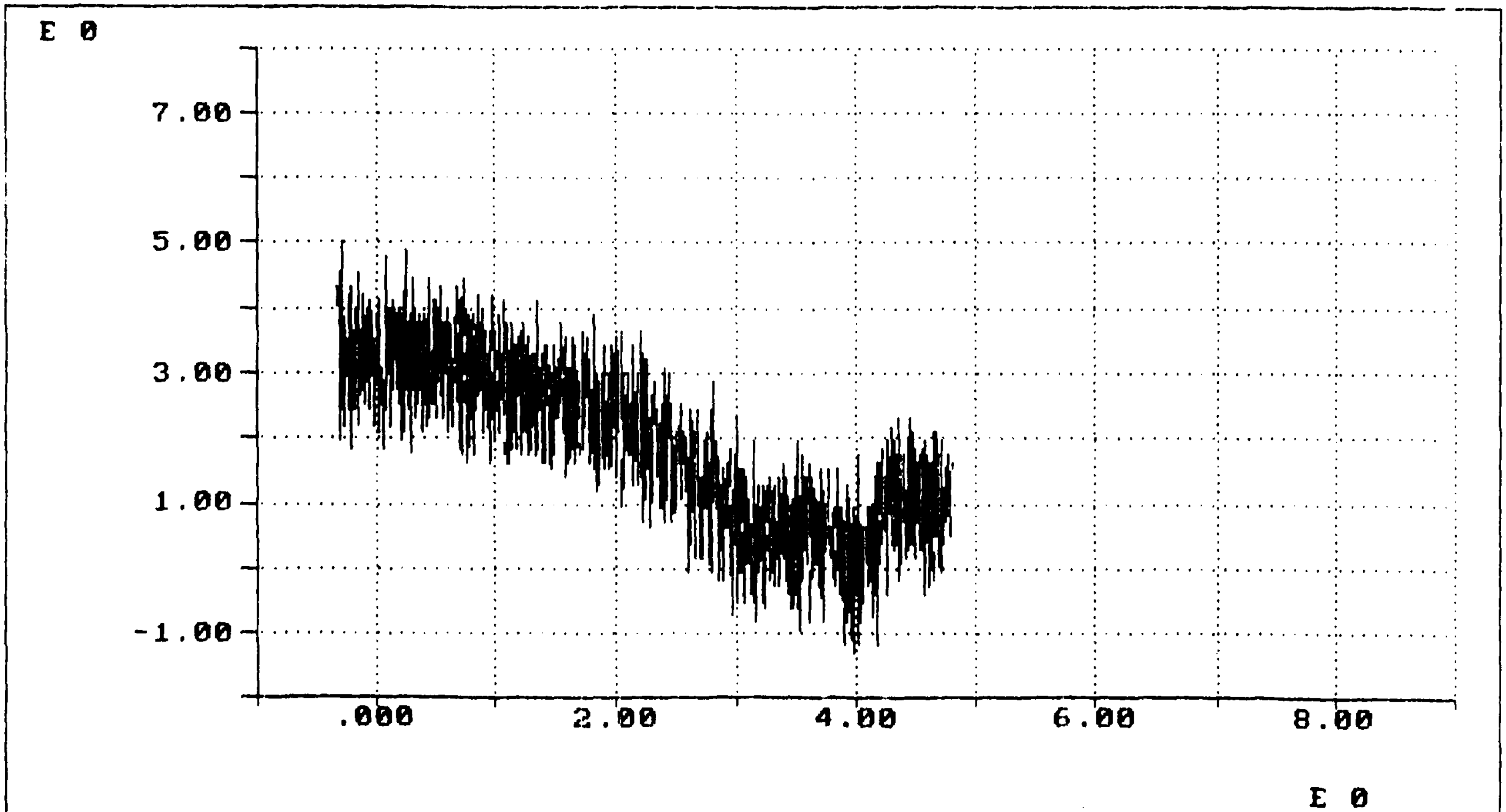
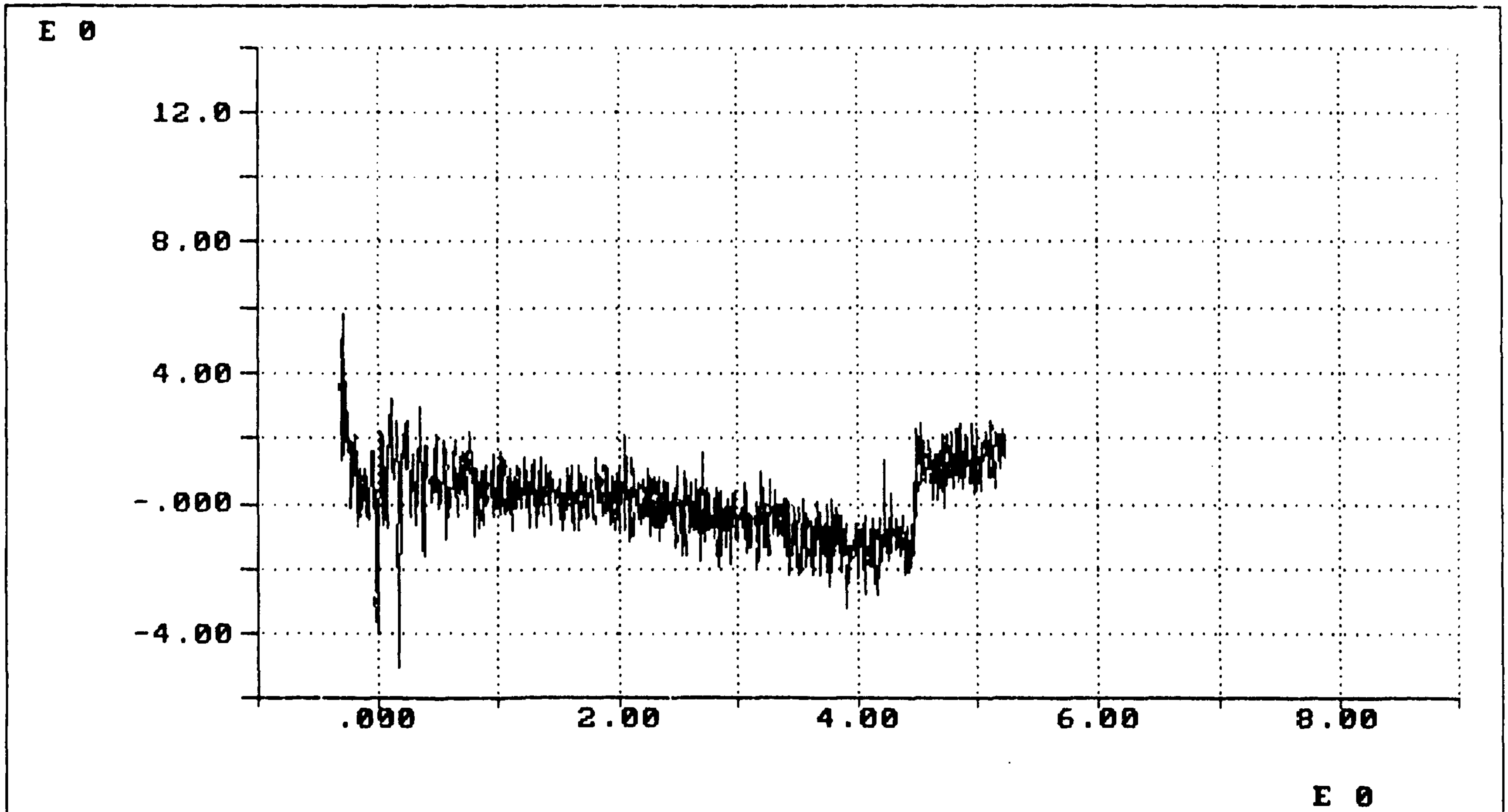
9.97
8.97
7.97
6.97
.000
1.00
2.00
3.00
4.00
E 0

Jul 31 K

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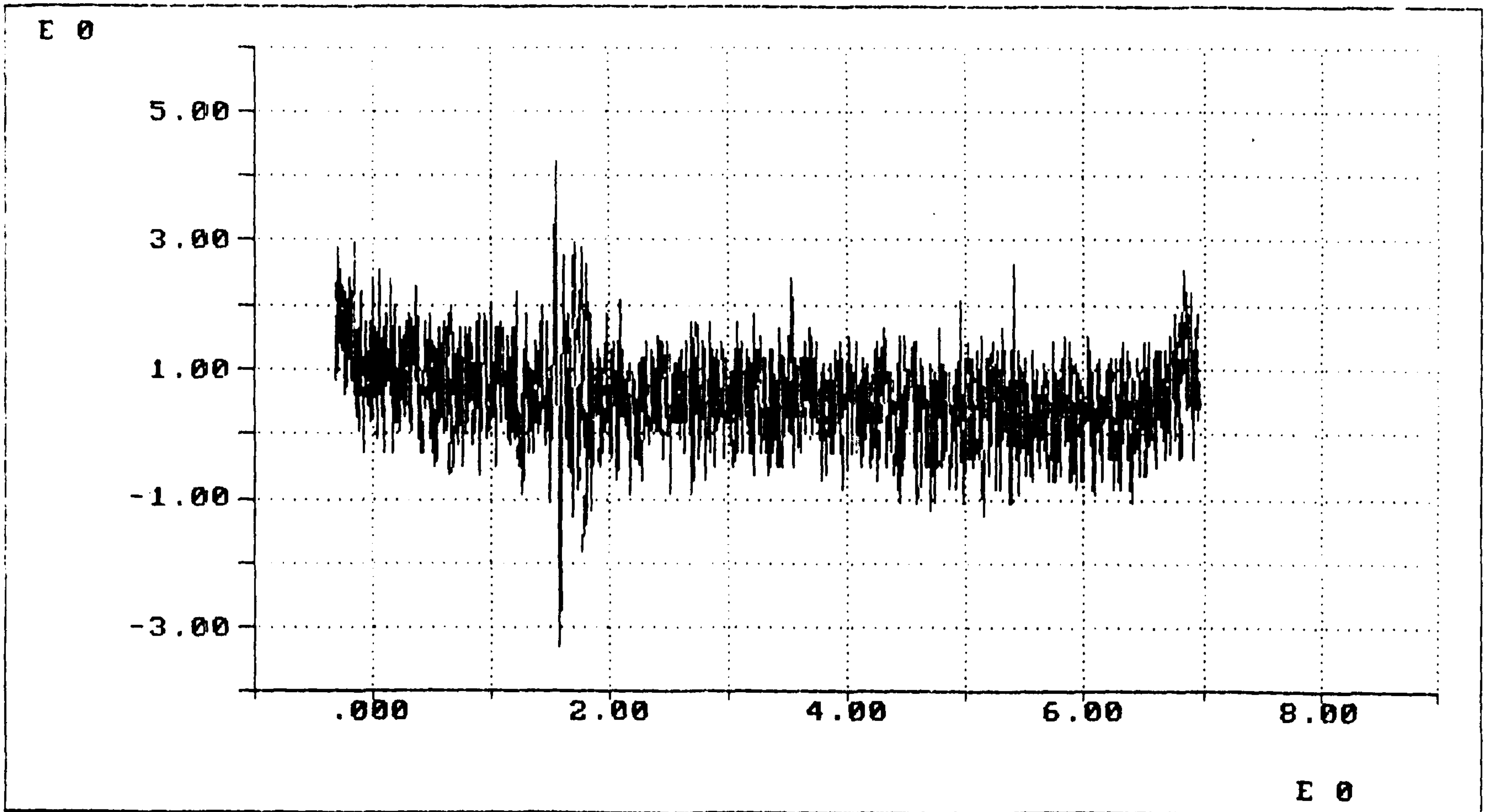
8.00
4.00
-.000
-4.00
.000
2.00
4.00
6.00
8.00
E 0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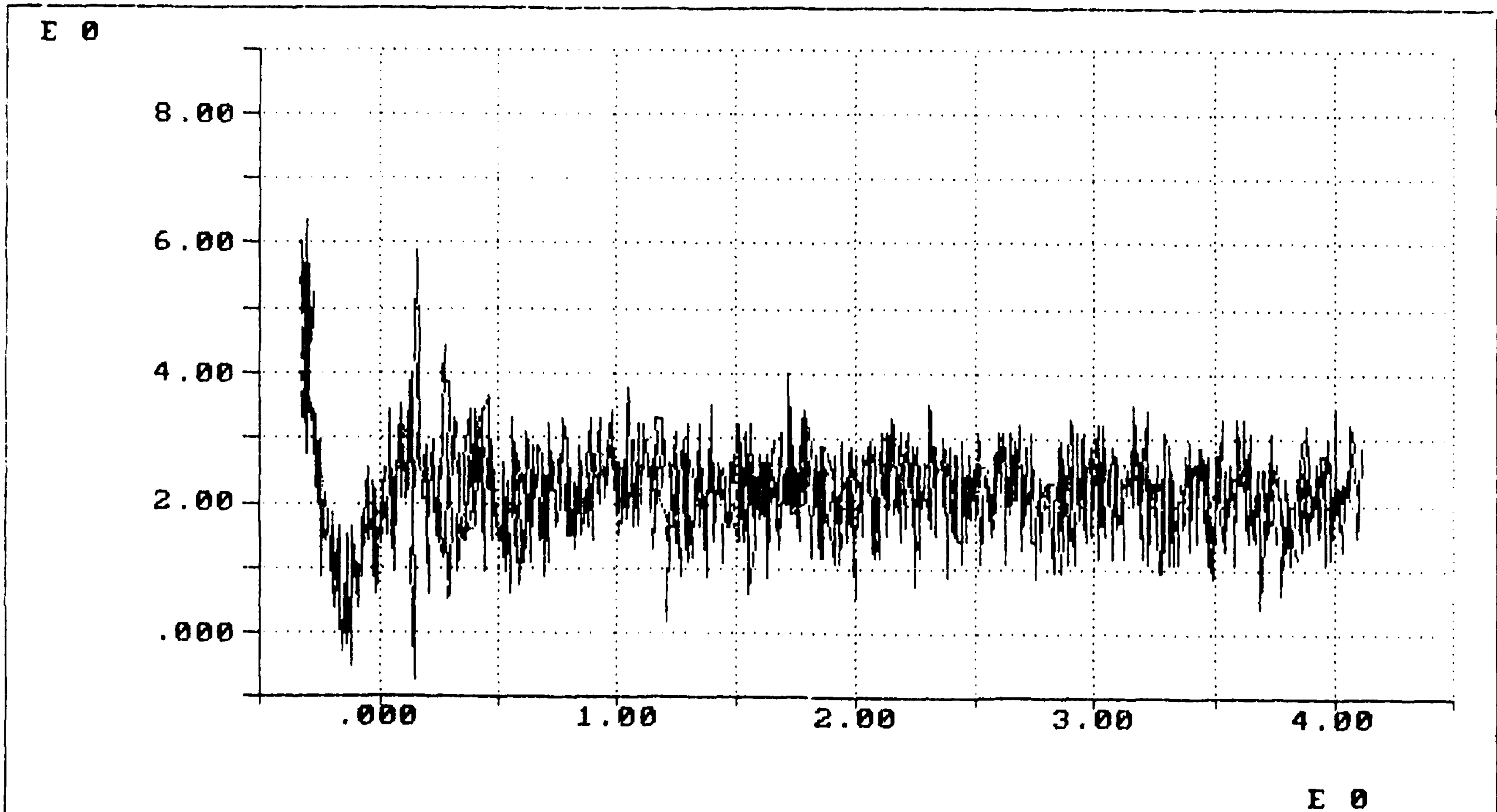
5.00
3.00
1.00
-1.00
-3.00
.000
2.00
4.00
6.00
8.00
E 0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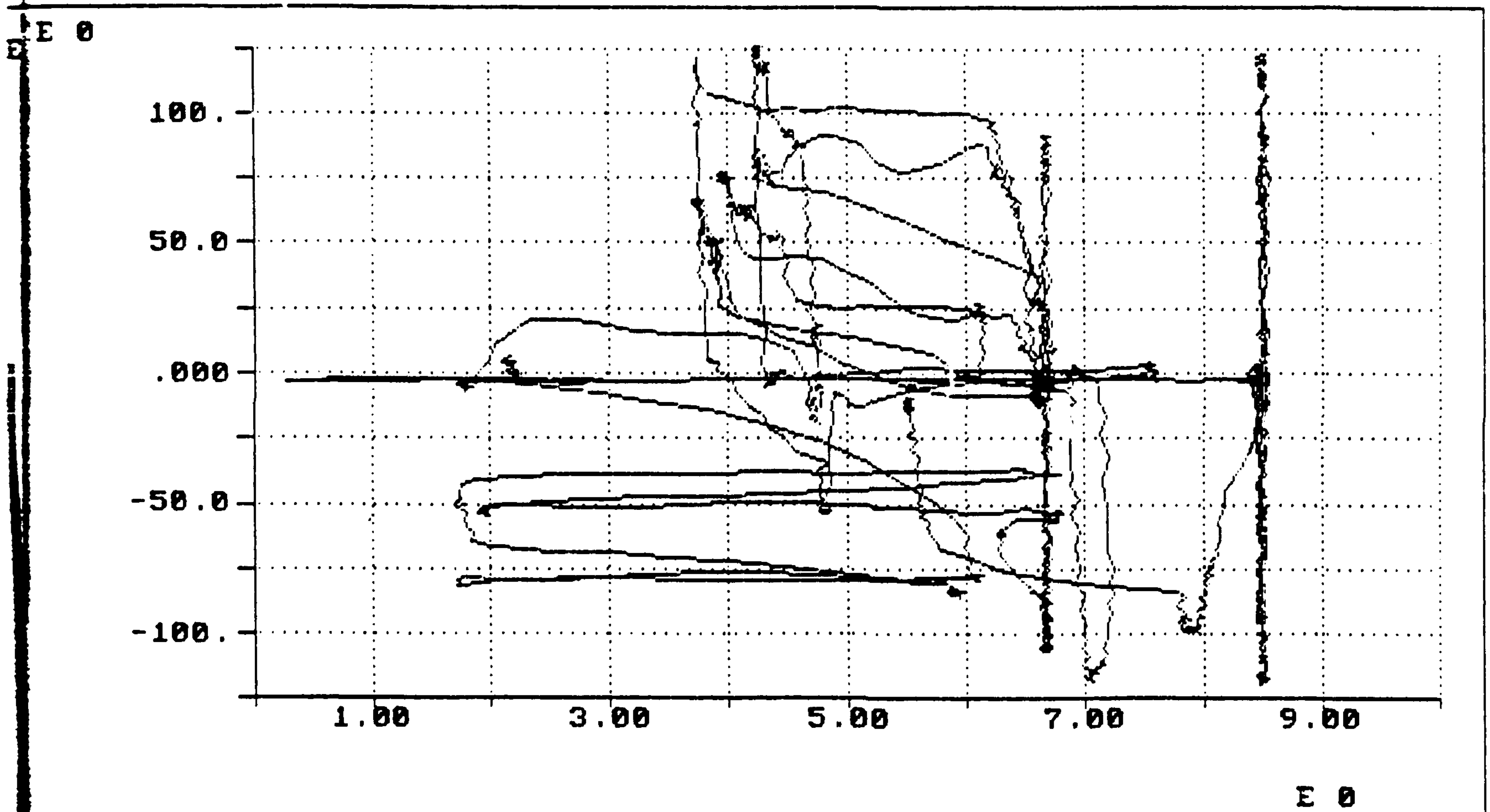
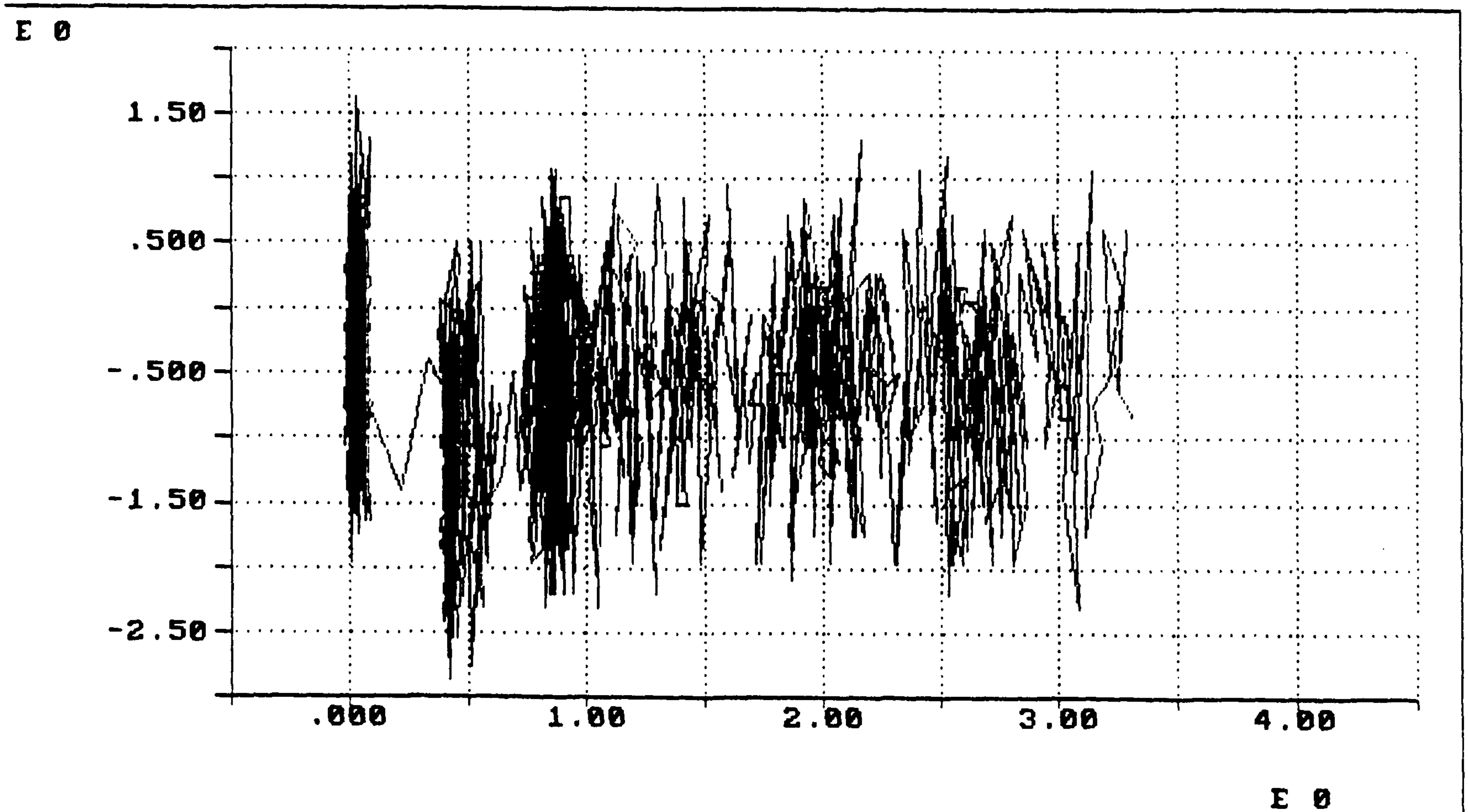
8.00
6.00
4.00
2.00
.000
.000
1.00
2.00
3.00
4.00
E 0

AUG 7C

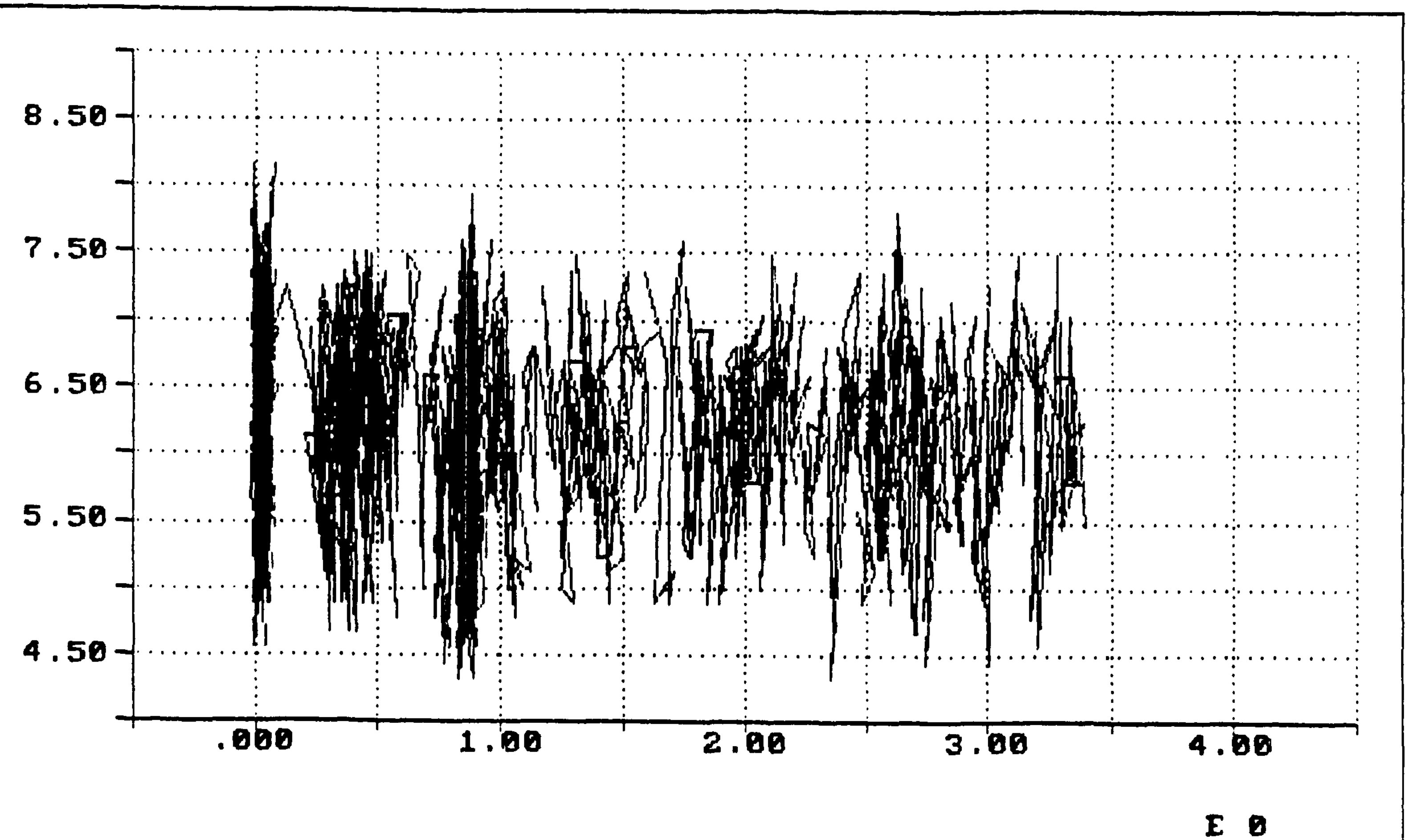


AUG 7D



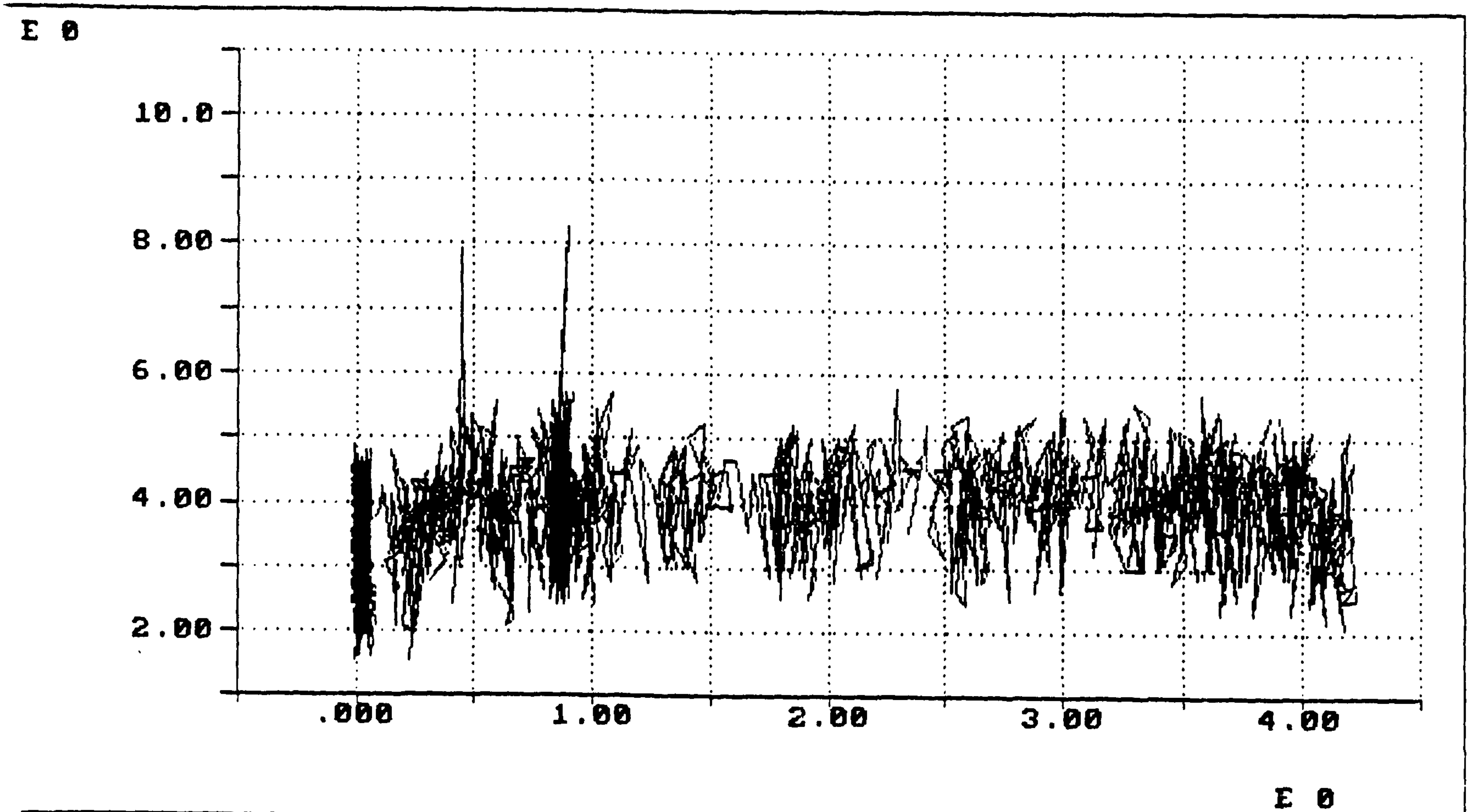
[redacted]

AUG 7 E



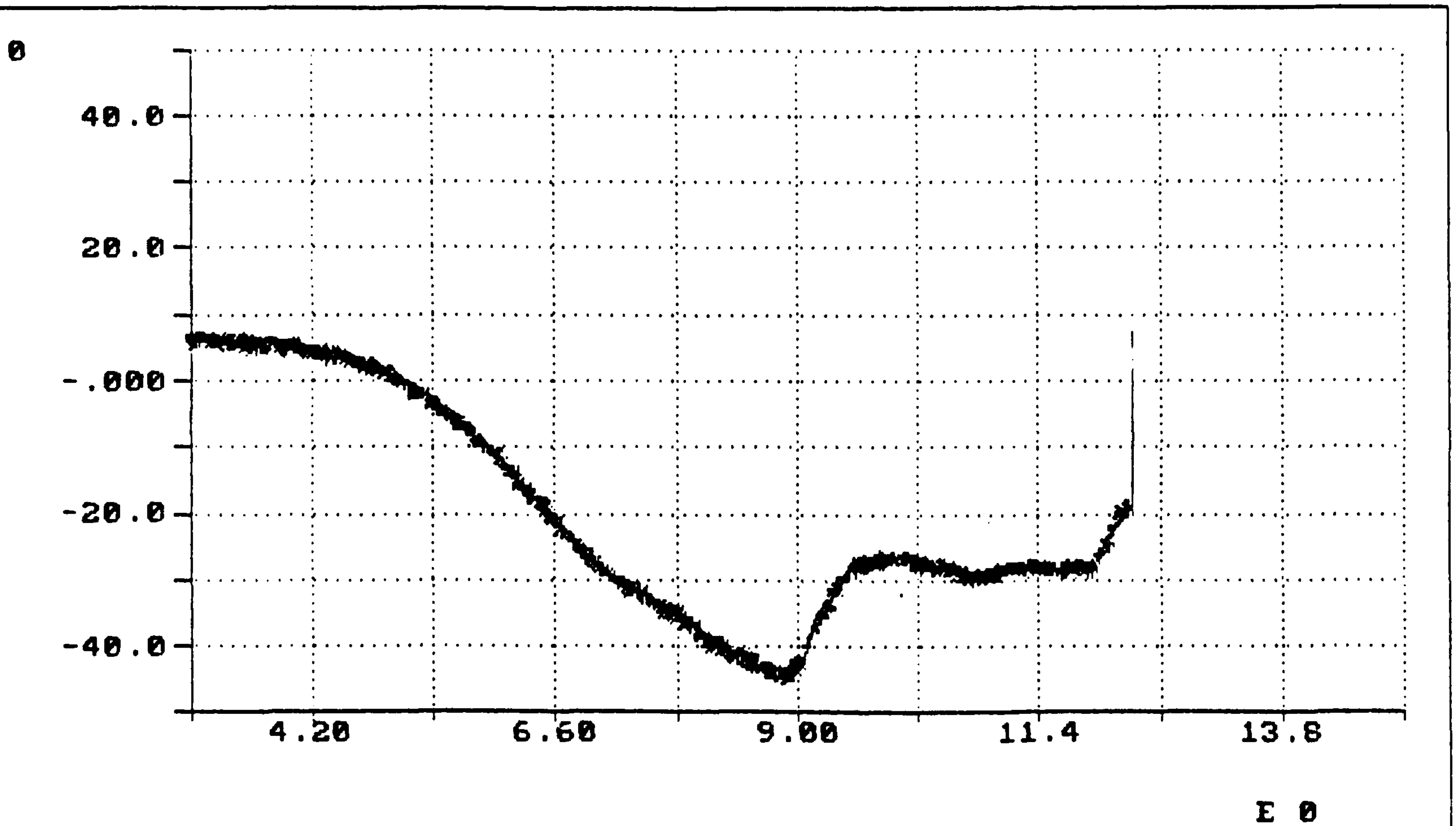
[redacted]

AUG 8A



[redacted]

AUG 8.B



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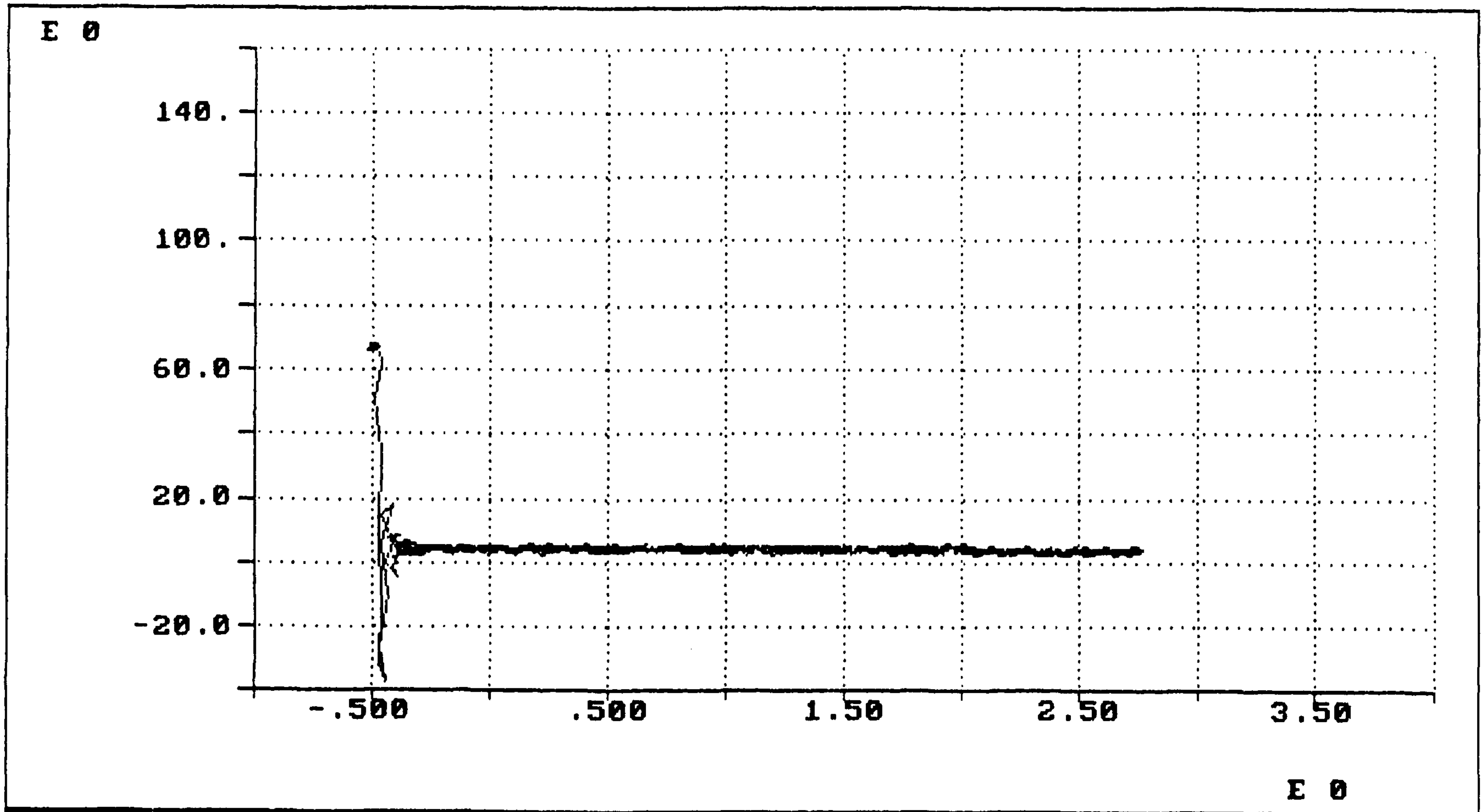
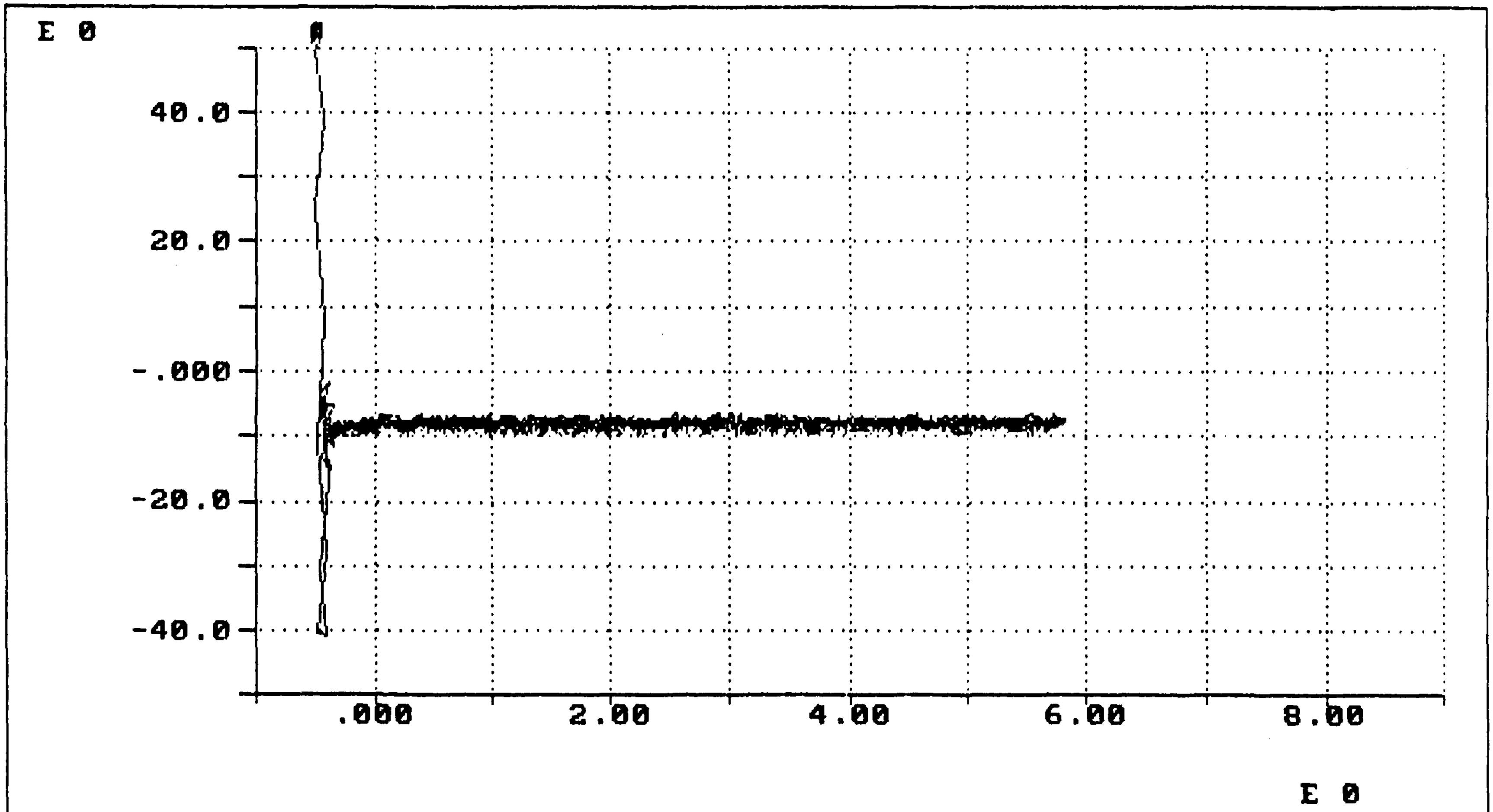
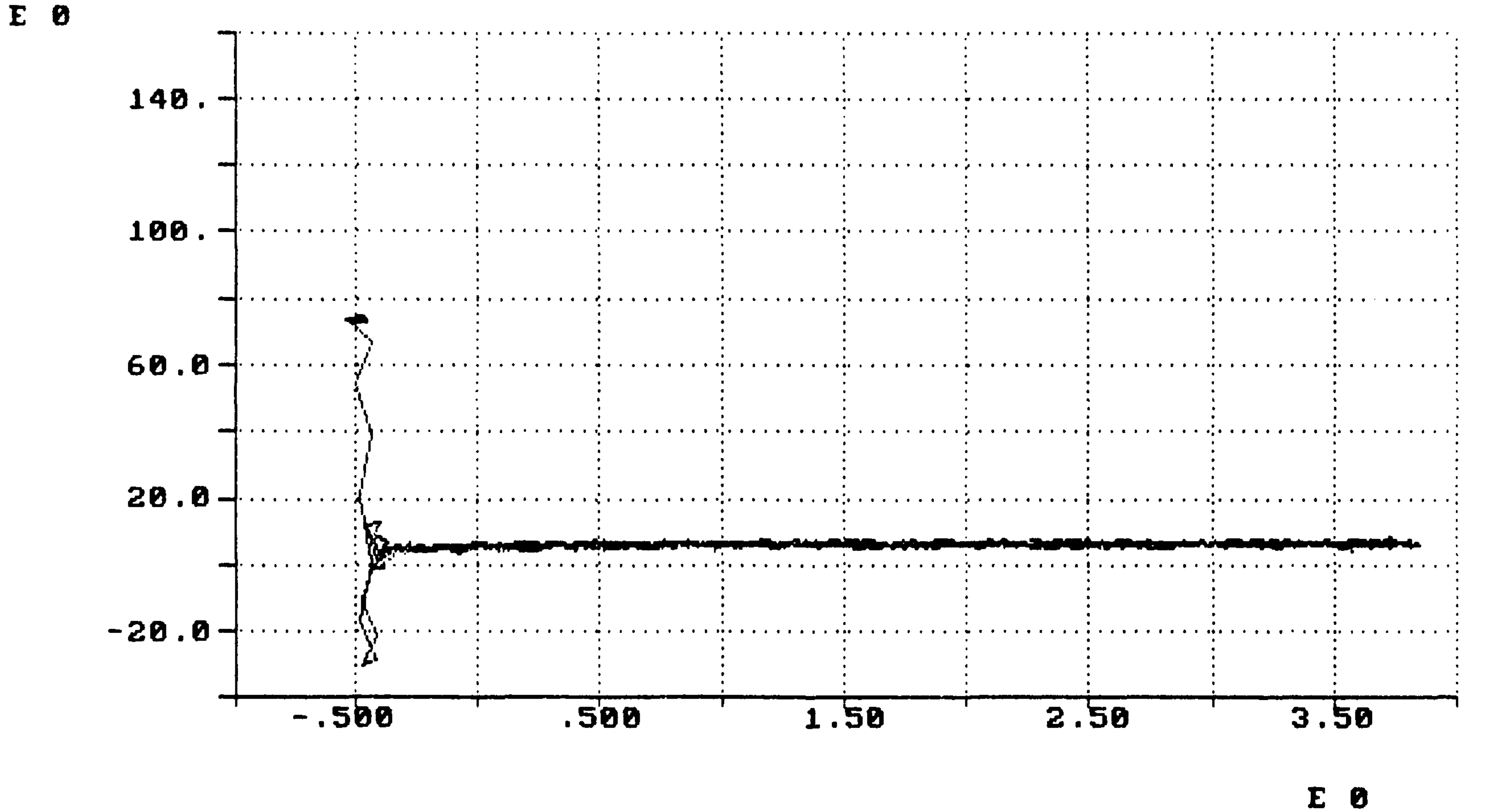


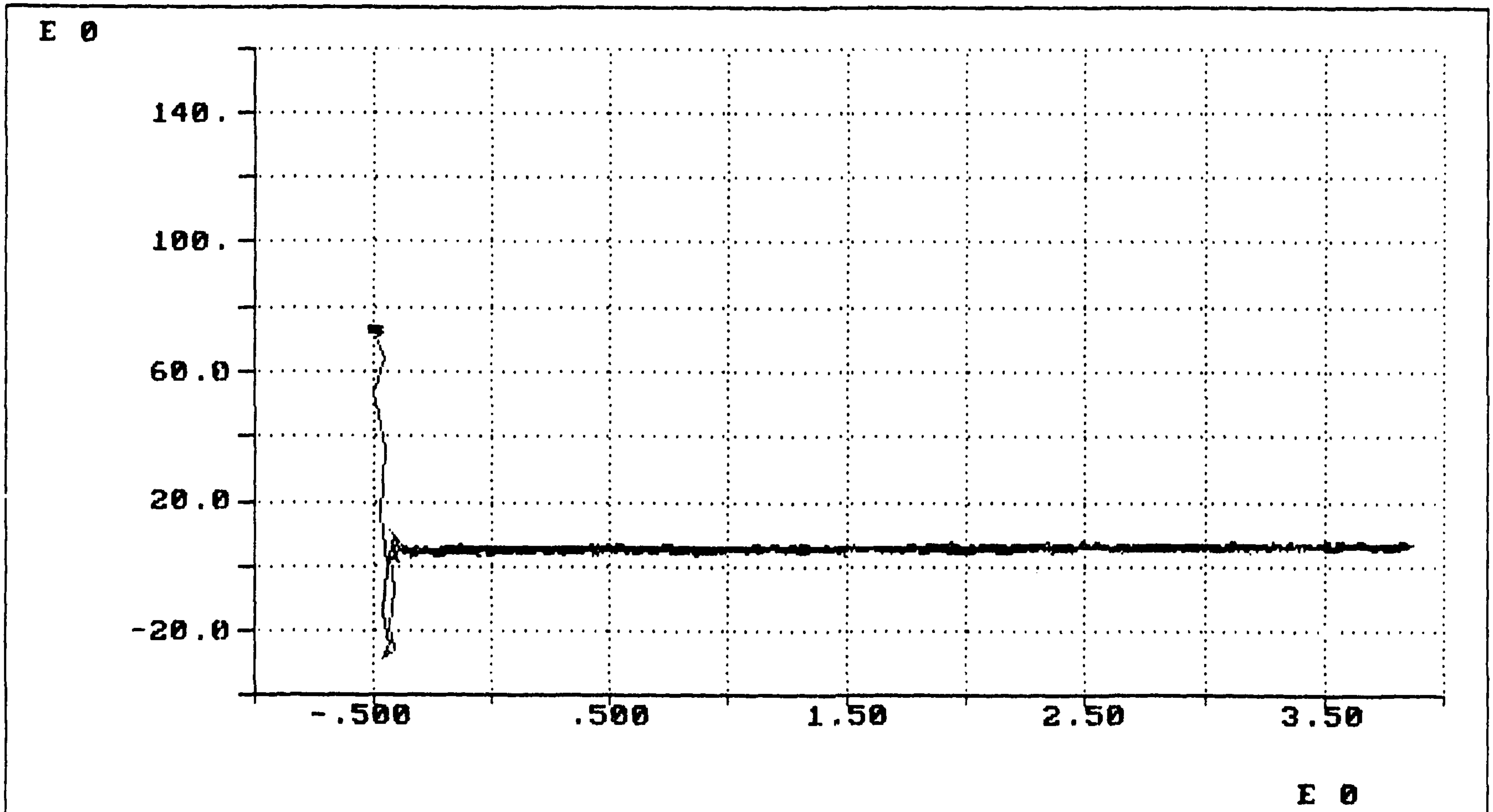
AUG8D



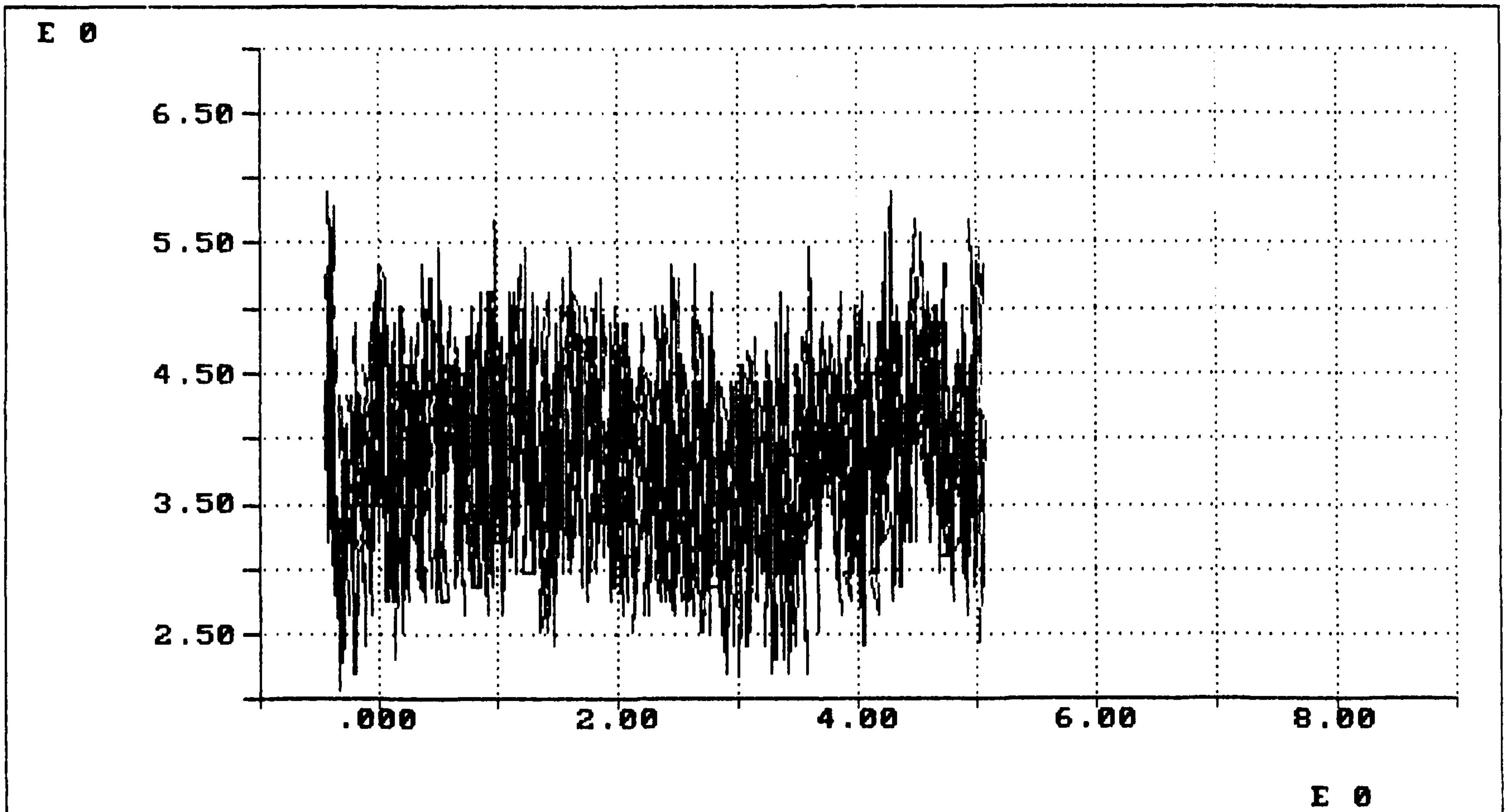
AUG 8 E



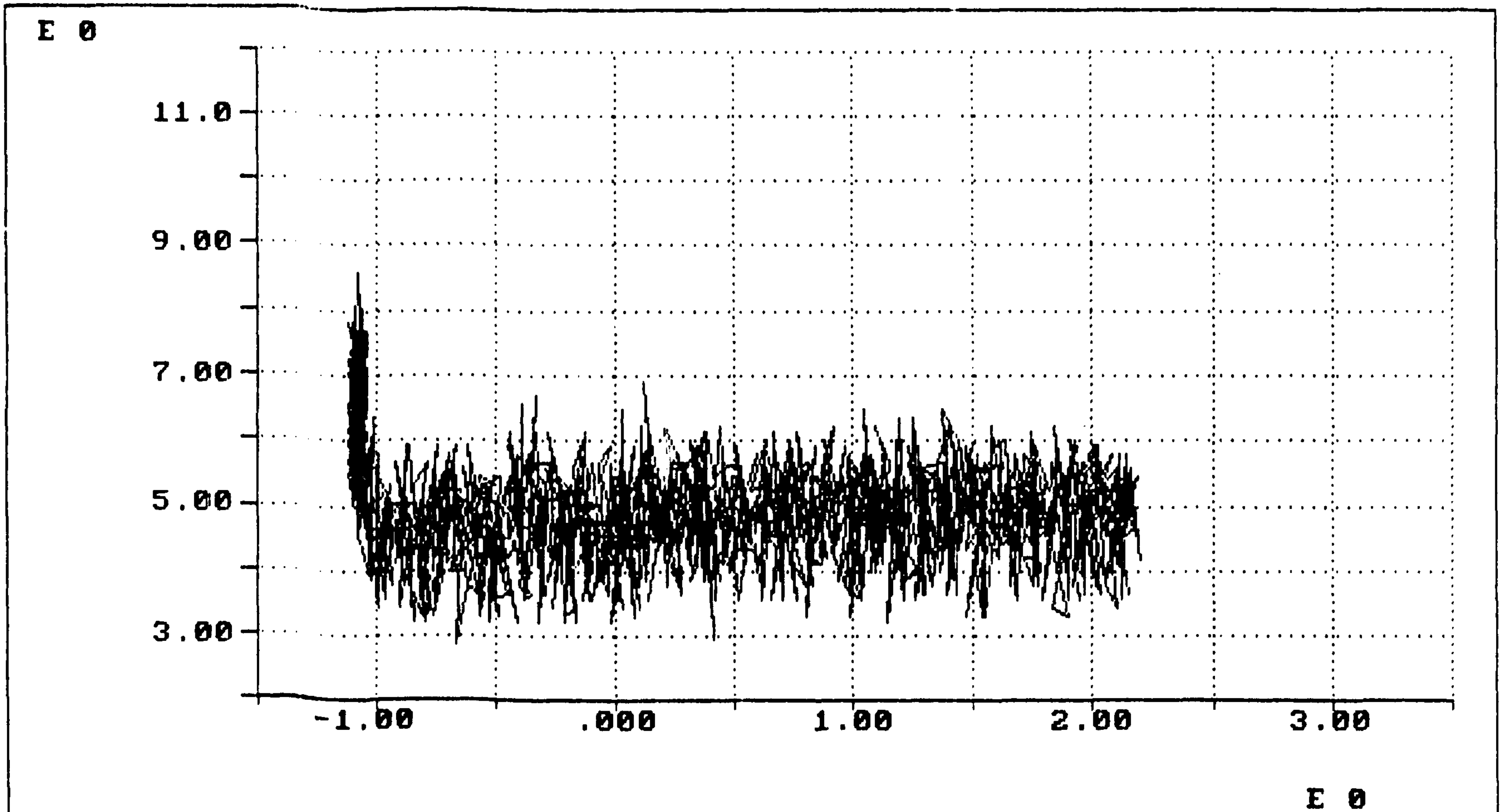
Aug8F



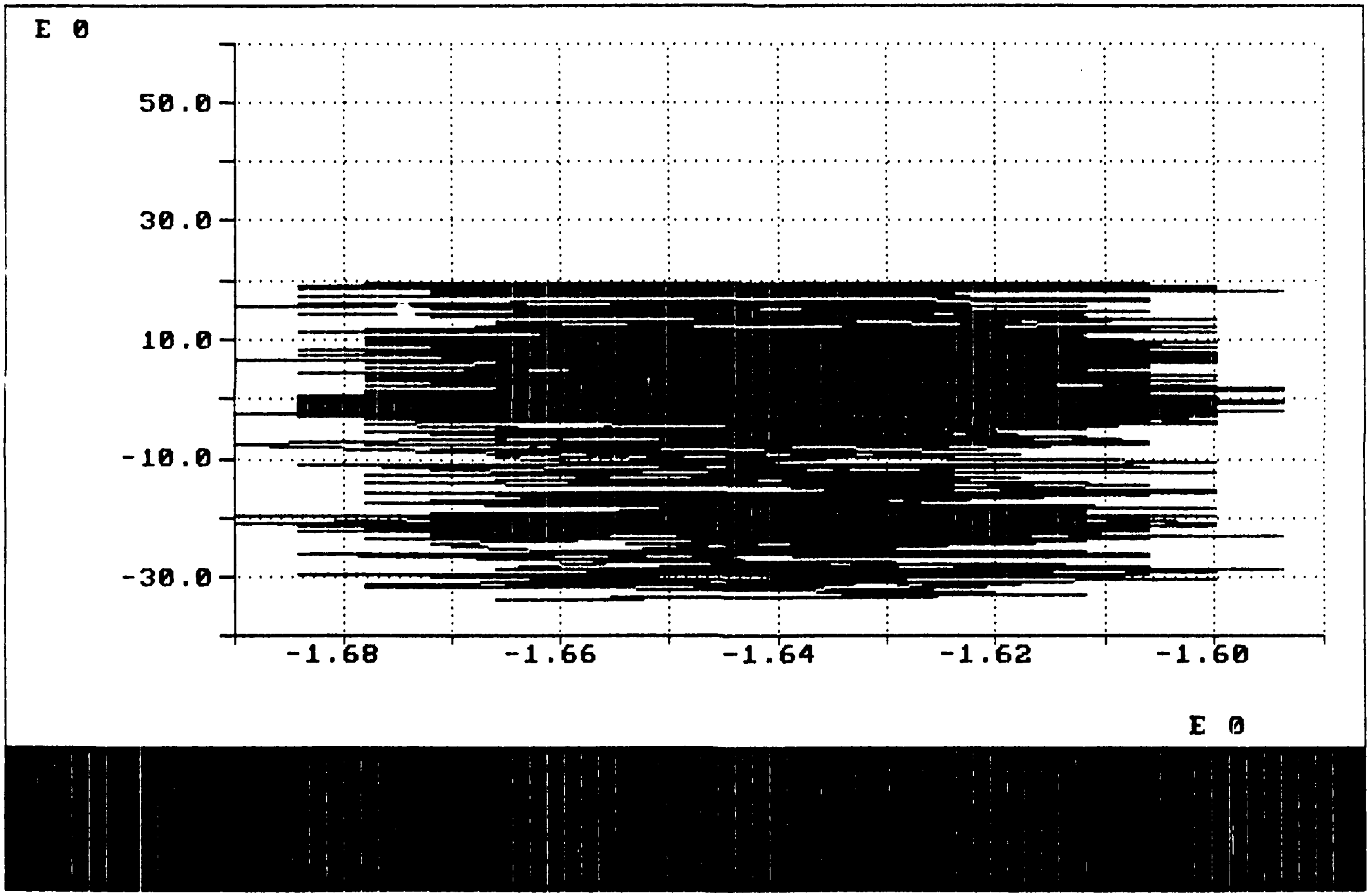
AUG 86



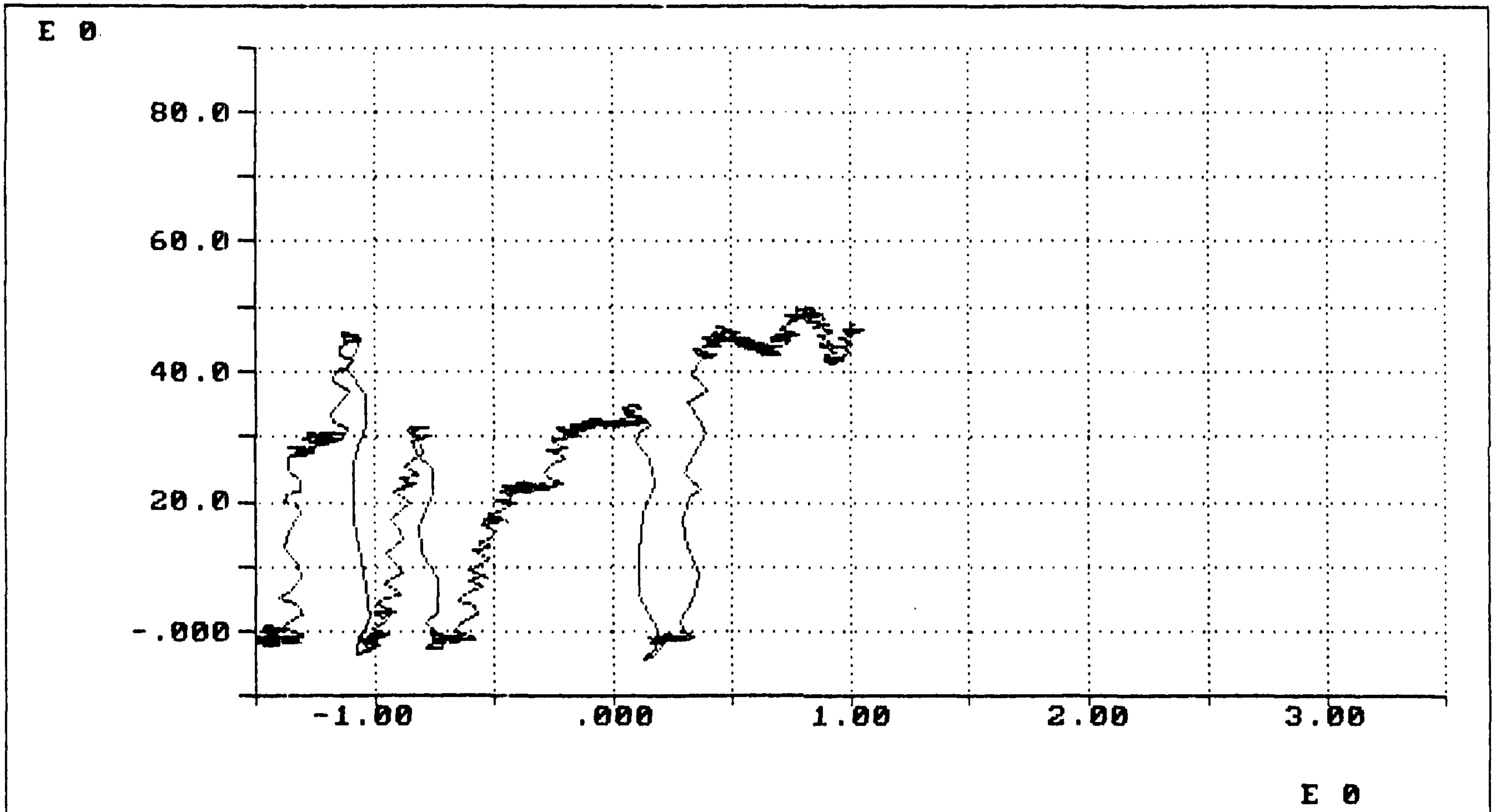
Aug 9 A



Aug 91



JUL 26

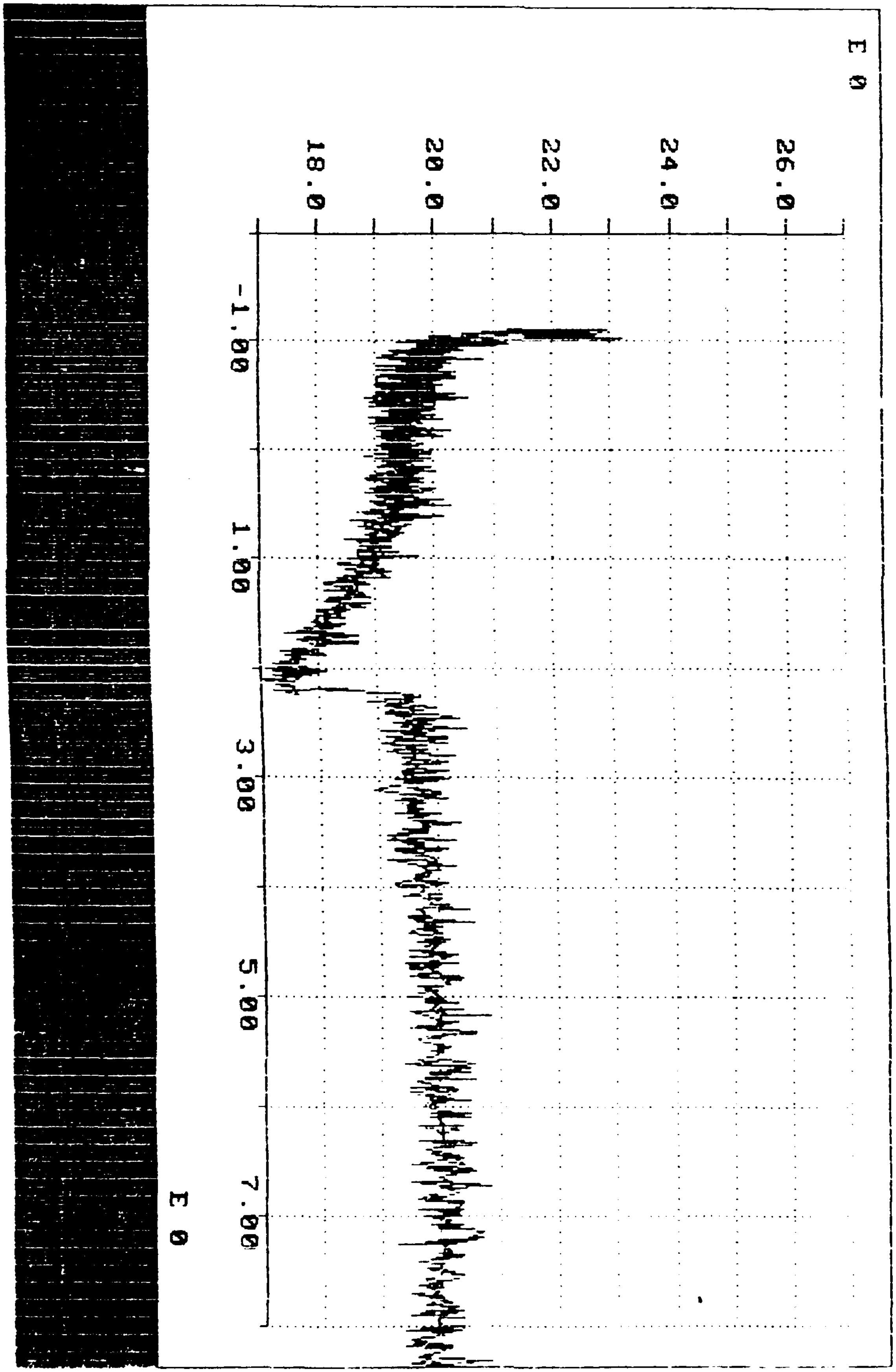


IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

File Name: <B:AUG28V.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 7)

Comments	Start#	Shape	#Repts
1> FERRONYL, 100 DEGREES CONTROLLED 2> SOME BLANCHING 3> ONE OF THE BEST WELDS TODAY	1	2 x 256	7



AUG 28 V

Ferronyl Temp=100

Fresh Bath 1

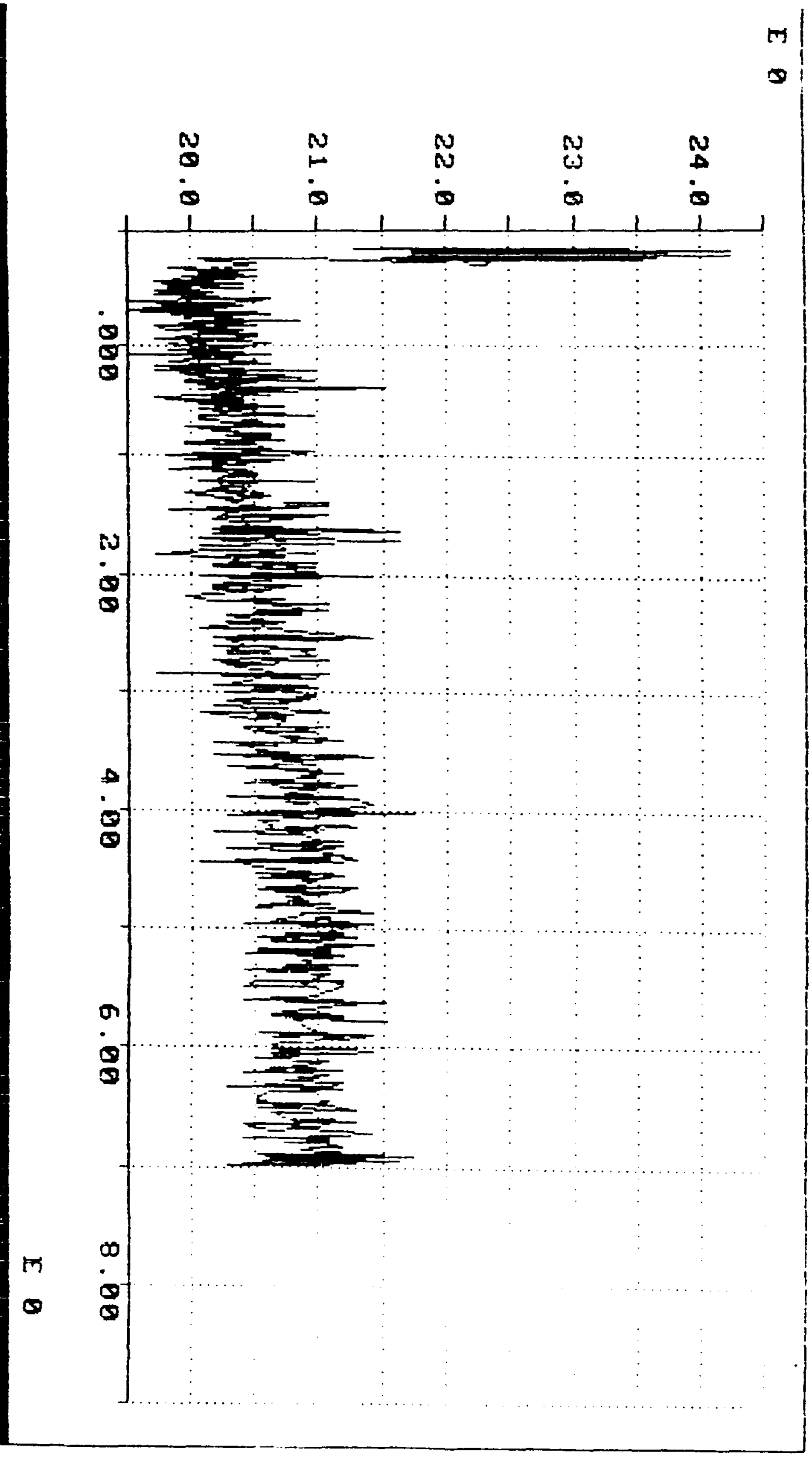
MMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

File Name: <B:AUG28W.USR> Quit/Continue: * :

8 Comments Subfiles (Total #: 9) :

	Start#	Shape	#Repts
> FERRONYL, 50 DEGREES CONTROLLED			
> NO VISUAL CHANGES	1	2 x 256	9
> NOT A VERY GOOD WELD			
> BURLEIGH STAGE DID NOT MOVE AT THE BEGINN:			

AUG28W



Ferronyl Temp = 50
Fresh Bond

File Input/Output

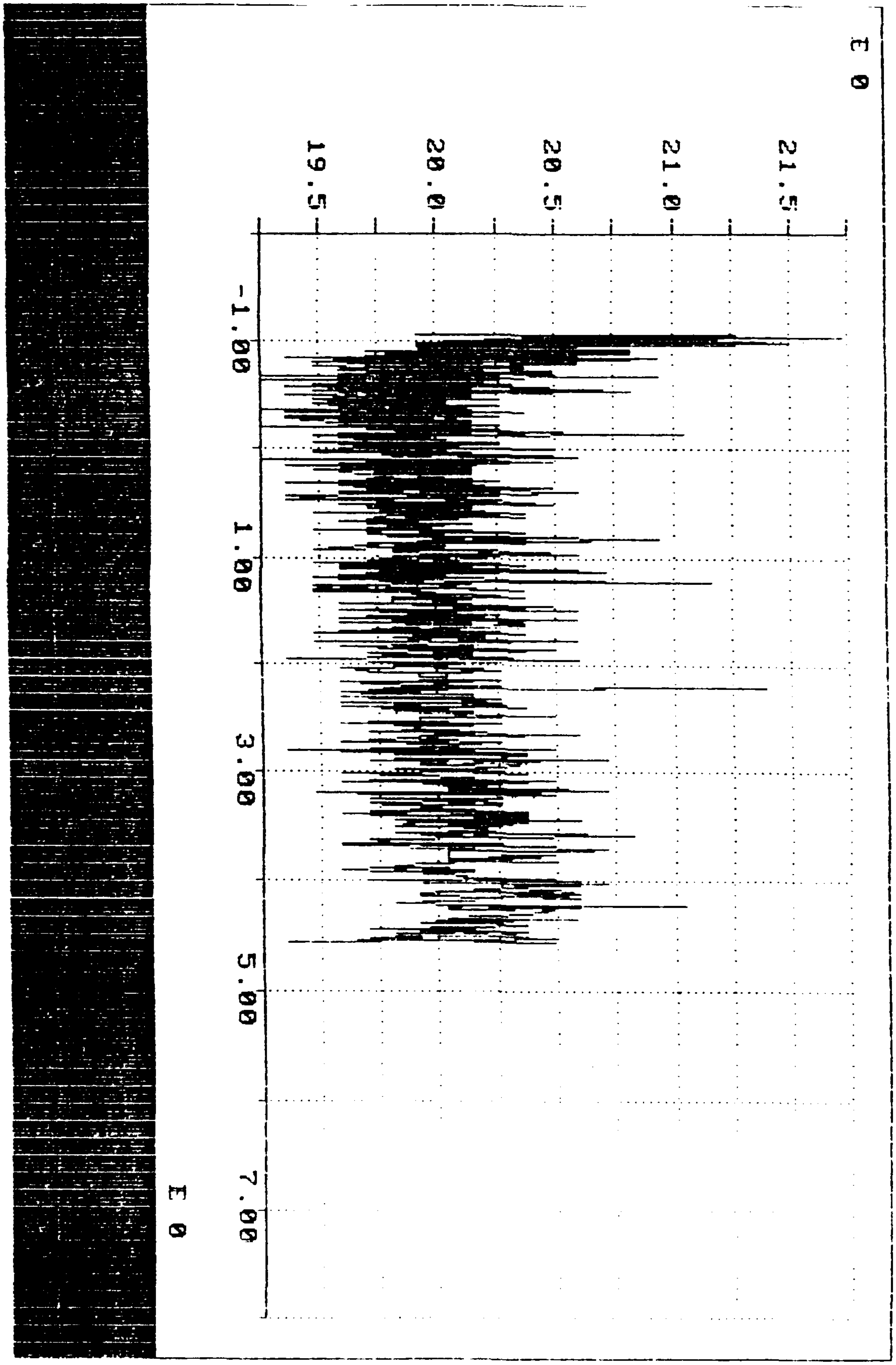
File Name: <B:AUG28X.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 6)

1> FERRONYL-60 DEGREES CONTROLLED
2> NO VISUAL CHANGES
3> ONE OF THE BETTER WELDS

Start#	Shape	#Repts
1	2 x 256	6

AUG 28 Y



Fresh Bowl

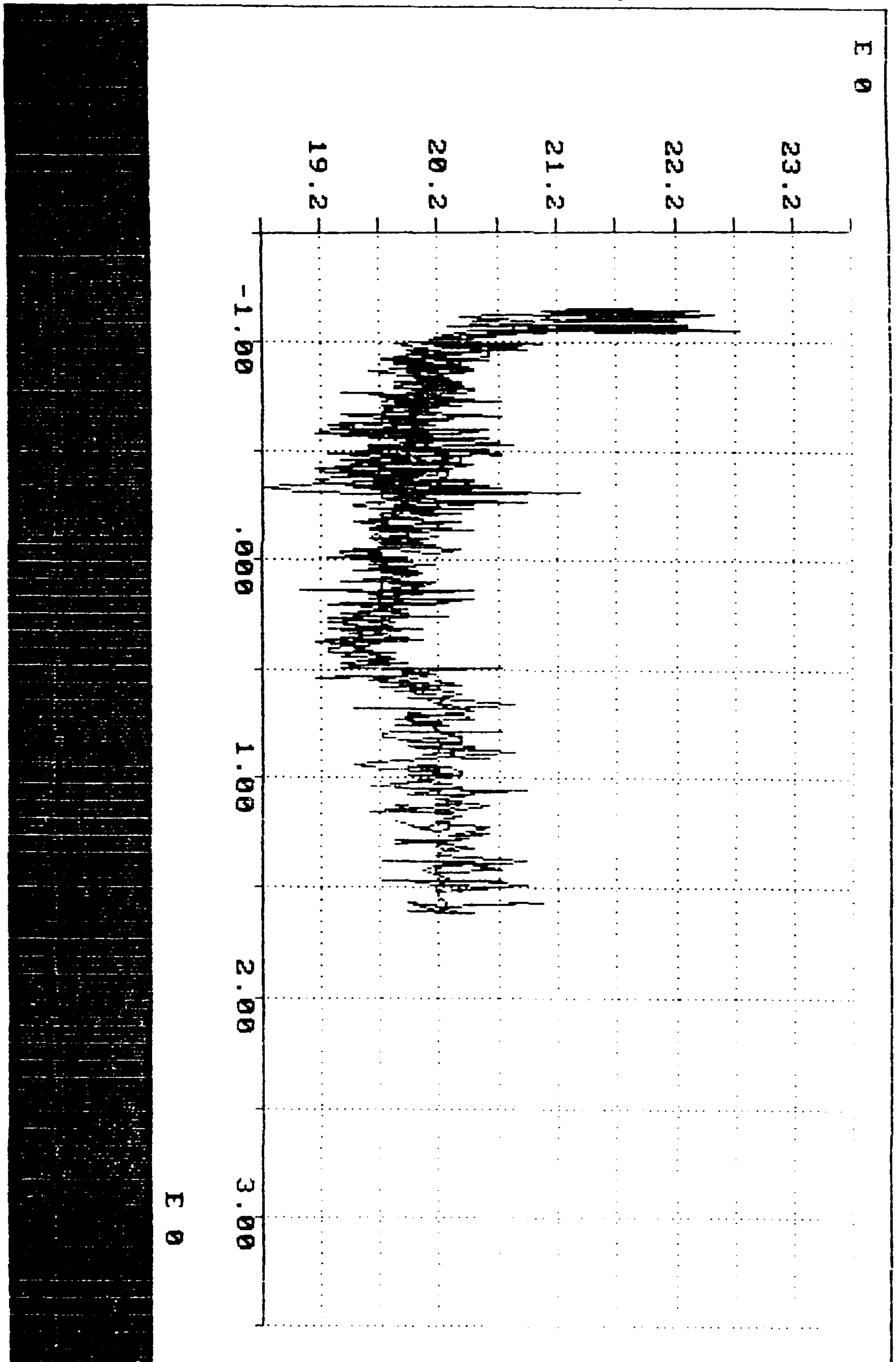
File Input/Output

File Name: <B:AUG28Y.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 4)

Comments	Start#	Shape	#Repts
1> INDIA INK, TEMP CONTROLLED AT 60	1	2 x 256	4
2> SLIGHT DESSICATION			
3> A GOOD WELD			
4> LOOKS BETTER THAN FERRONYL			

AUG 28Y



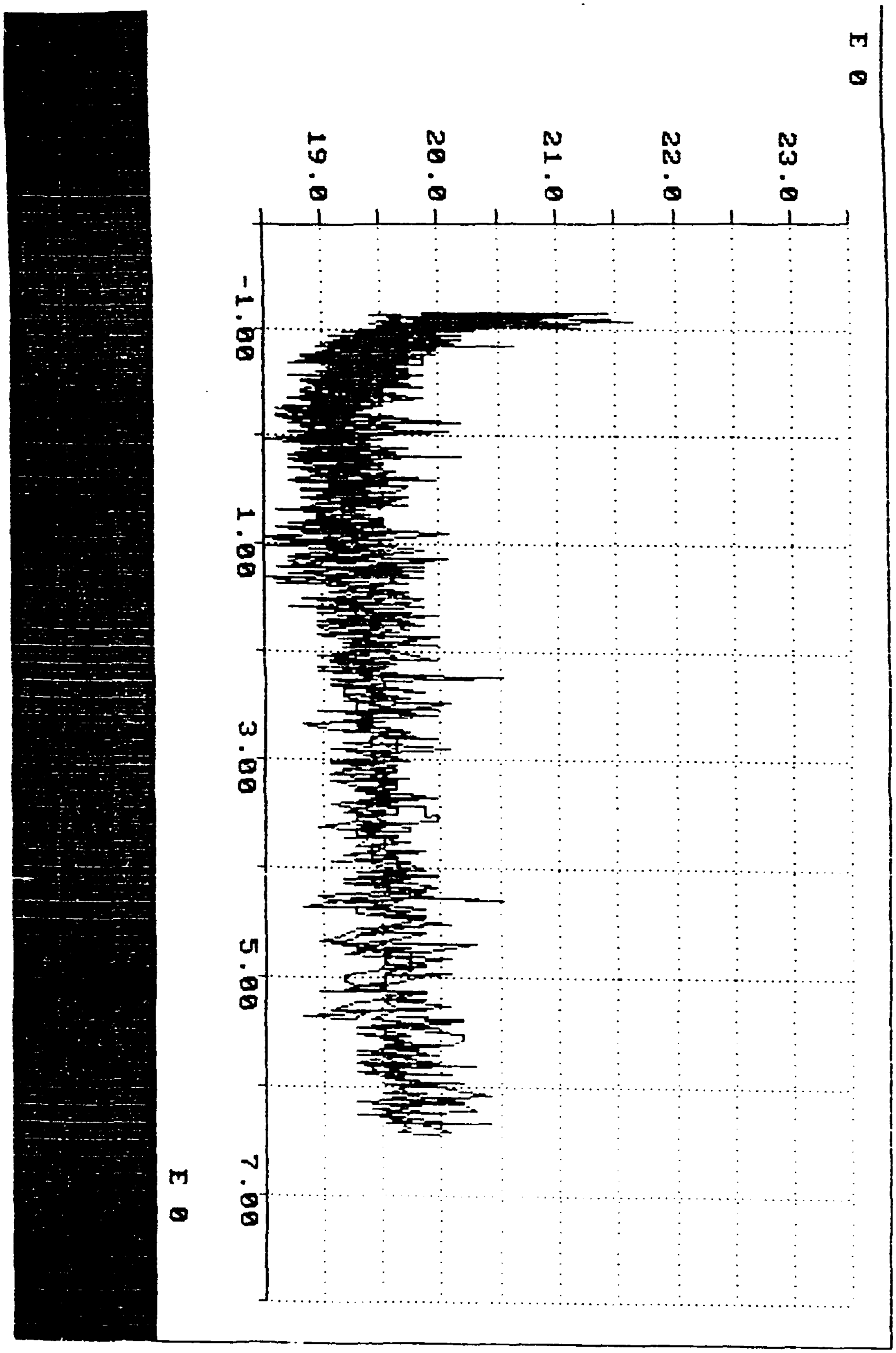
File Input/Output

File Name: <B:AUG28AB.USR>   Quit/Continue: *

8 Comments   Subfiles (Total #: 7)

1> INDIA INK, 60 DEGREES, LARGE APERTURE, SL: Start#   Shape   #Repts
2> WELDED. ONE OF THE BETTER WELDS   1   2 x 256   7
3>

AUG 28 1985



Large aperture
India Ink
Temp = 60°

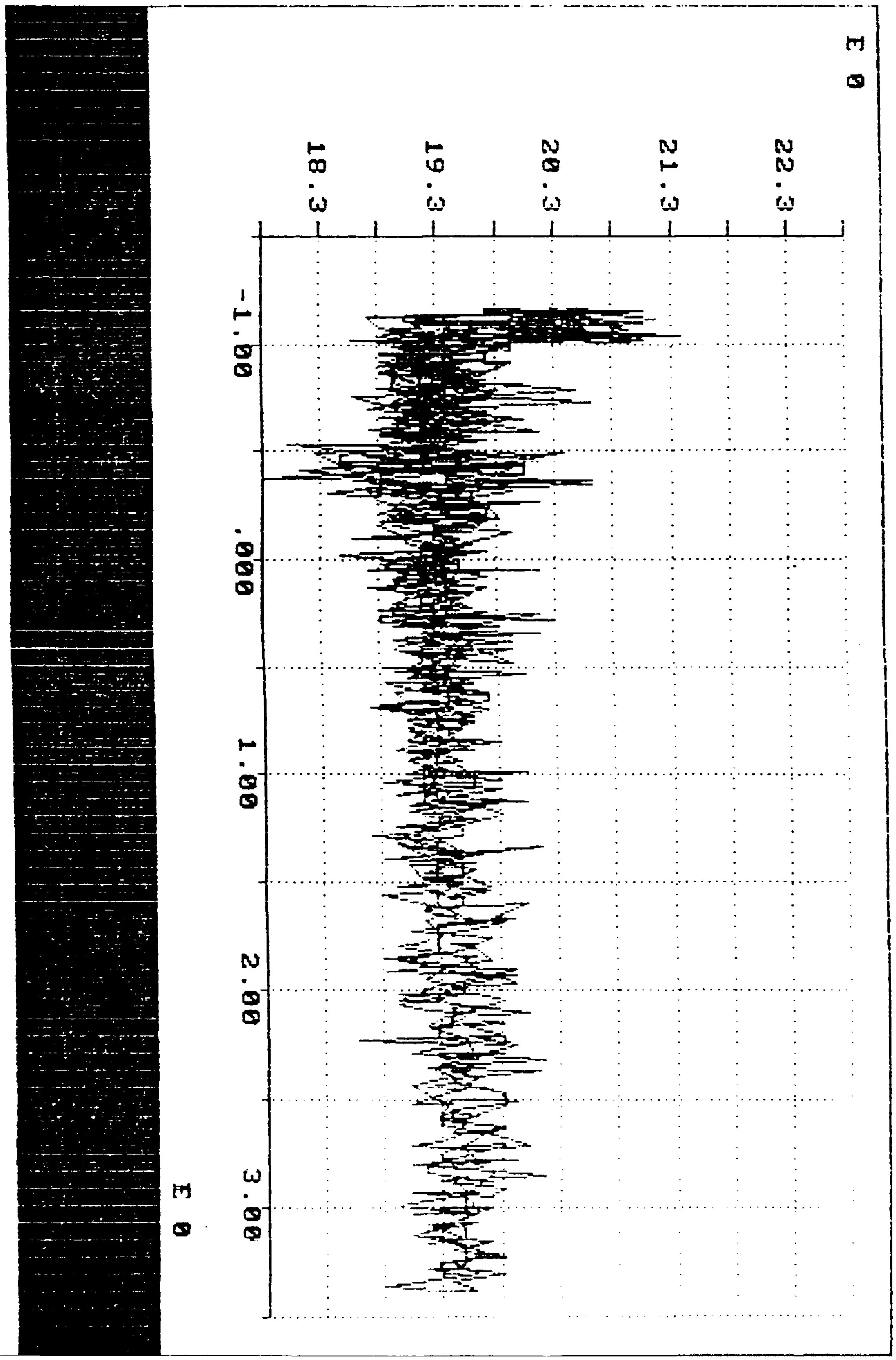
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
MMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

File Name: <B:AUG28AA.USR>   Quit/Continue: ¥   :

8 Comments   Subfiles (Total #: 5)   :

MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9

1> LARGE APERTURE, INDIA INK, 50 DEGREES   : Start#   Shape   #Repts :
2> WELDED   : 1   2 x 256   5 :



AUG28AA

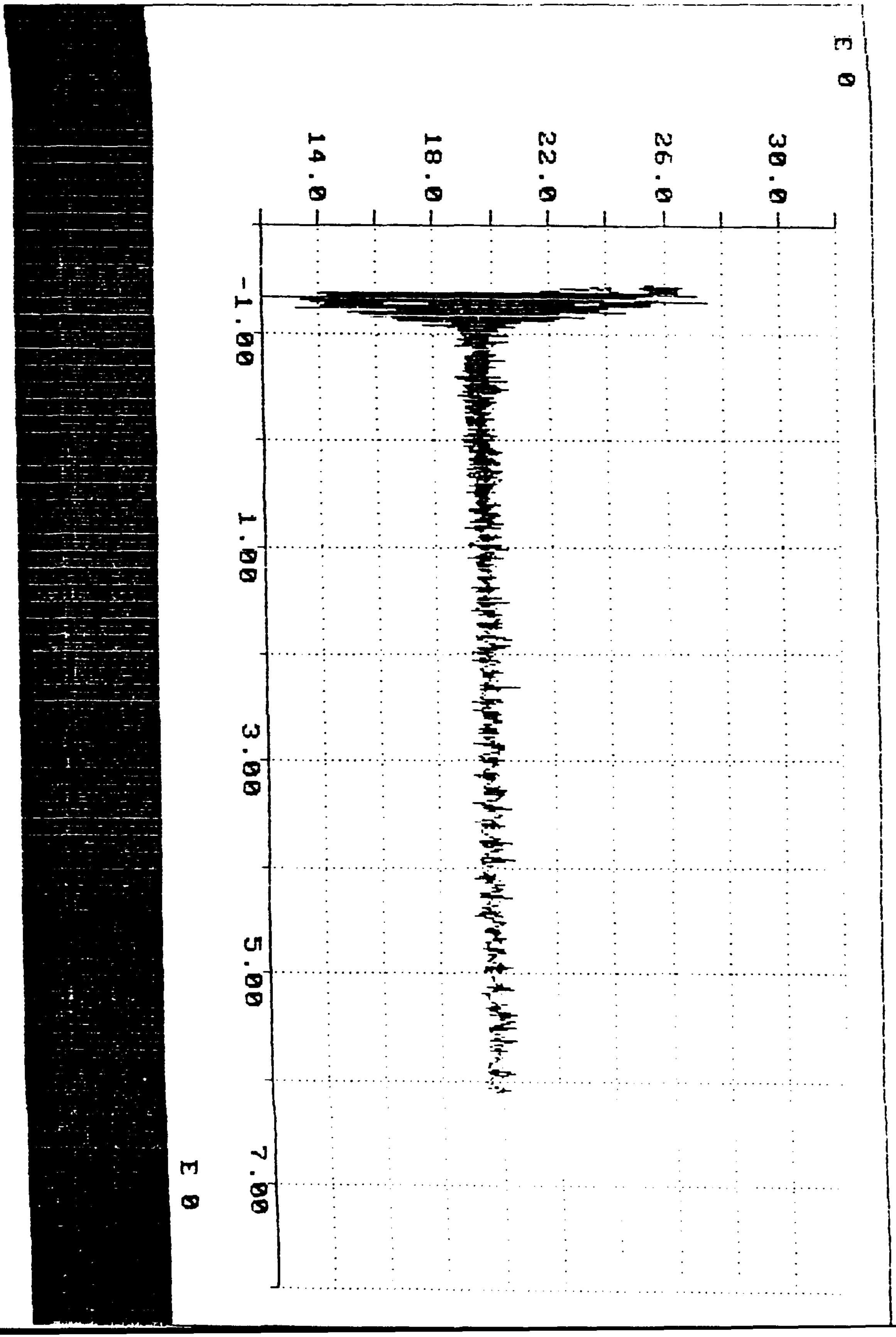
Large Aperture
India Ink
Temp = 50

File Input/Output

File Name: <B:AUG28Q.USR>   Quit/Continue: *

8 Comments   Subfiles (Total #: 7)

1> FERRONYL, TEMP SET = 80 DEGREES, TC MAX =:	Start#	Shape	#Repts
2> TOO DEEP.	1	2 x 256	7
3> NOT A GREAT WELD			



AUG 28Q

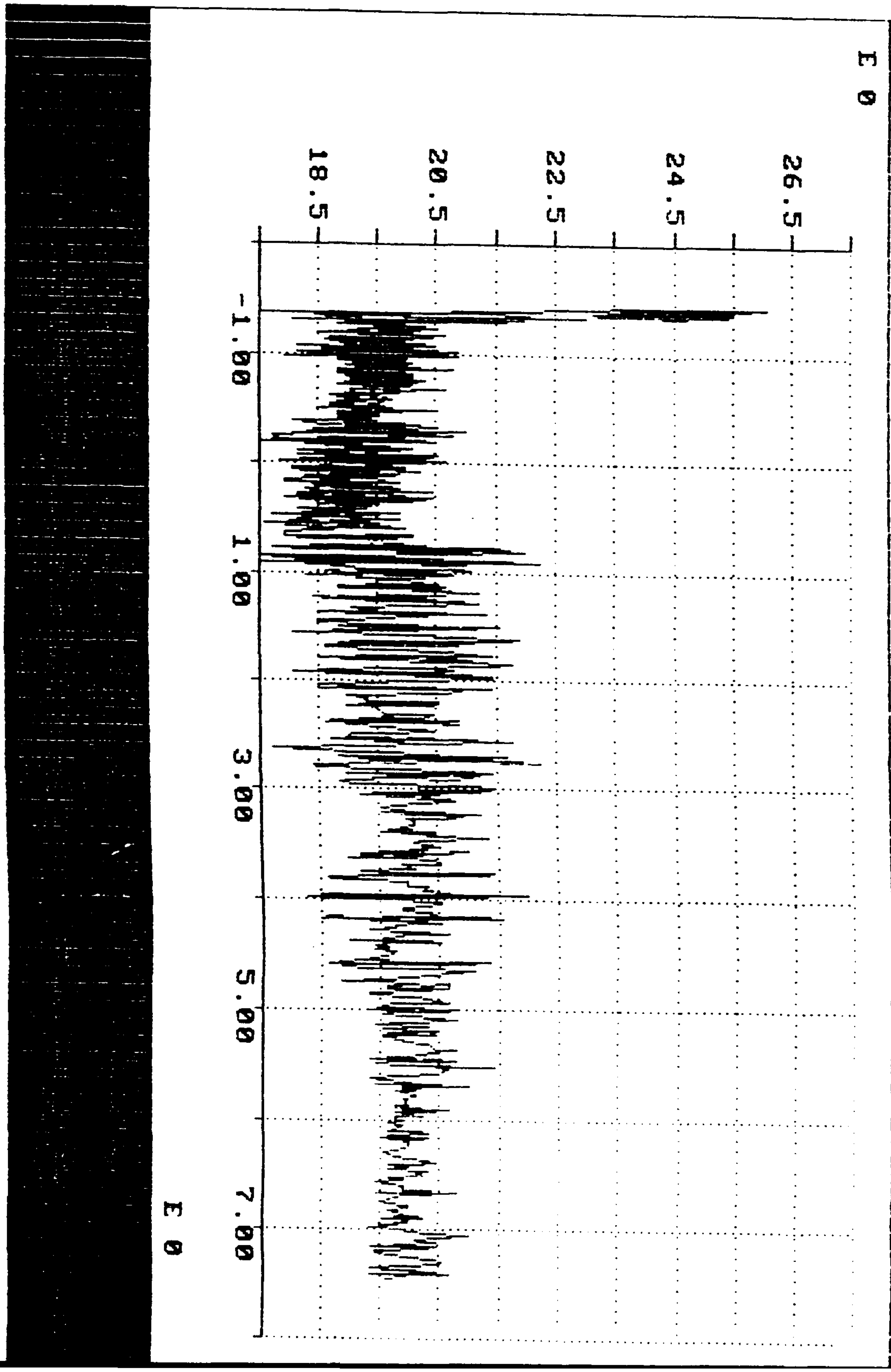
Ferronyl Temp 80°
TC too deep

MMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMM

File Name: <B:AUG28R.USR> Quit/Continue: *

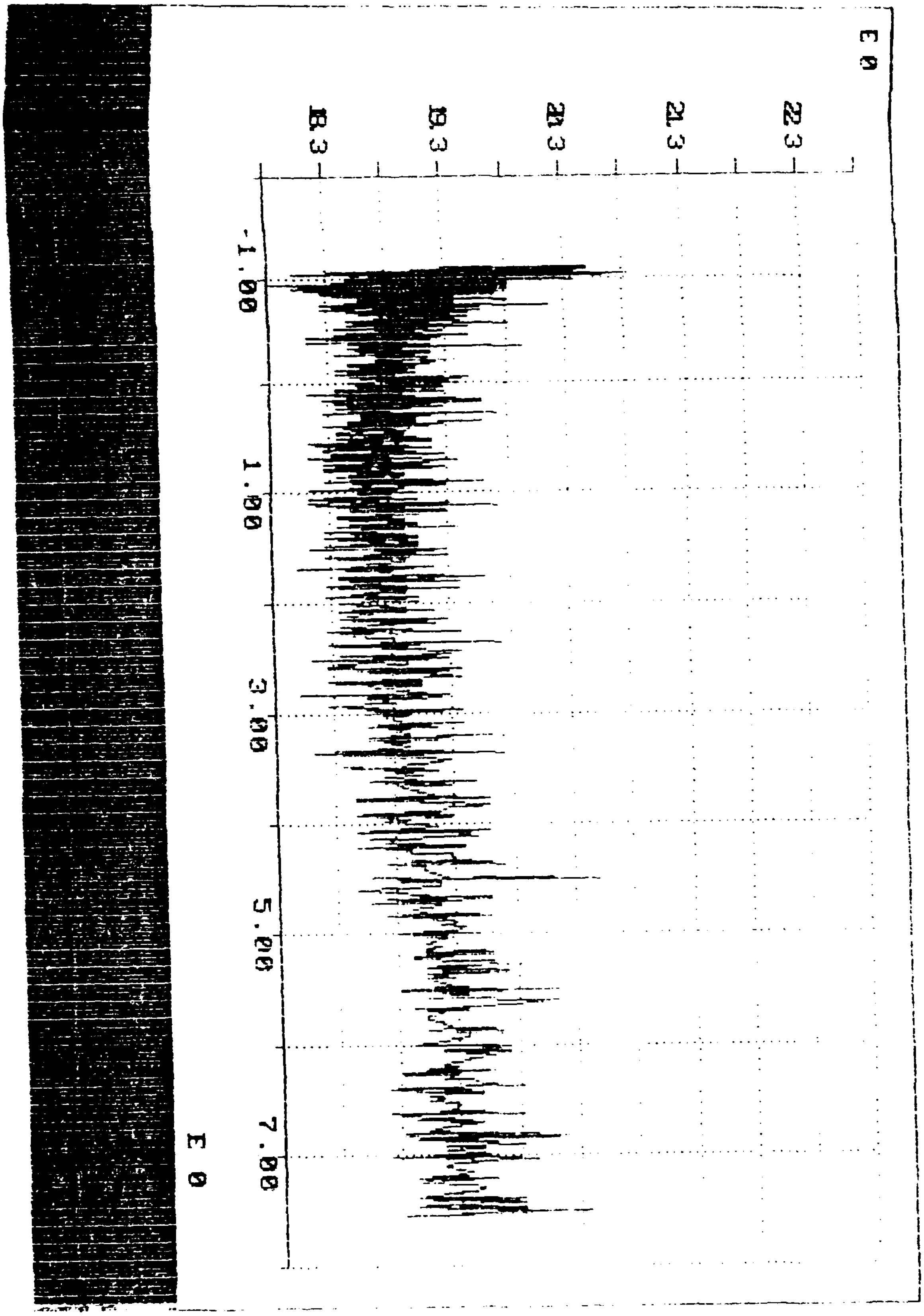
8 Comments Subfiles (Total #: 7)

1> REPEAT FERRONYL-TEMP = 80	Start#	Shape	#Repts
2> BETTER TC PLACEMENT	1	2 x 256	7
3> SOME BLANCHING			
4> WELDED			



Ferronyl Temp 80°C

Aug 28



Ferronyl

MMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

File Name: <B:AUG28S.USR>   Quit/Continue: *

8 Comments   Subfiles (Total #: 8)

1> FERRONYL TEMPERATURE AT 100 DEGREES	Start#	Shape	#Repts
2> SOME BLANCHING AND DESSICATION	1	2 x 256	8
3> WELD WAS NOT VERY STRONG			

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

: File Name: <B:AUG28T.USR> Quit/Continue: * : :

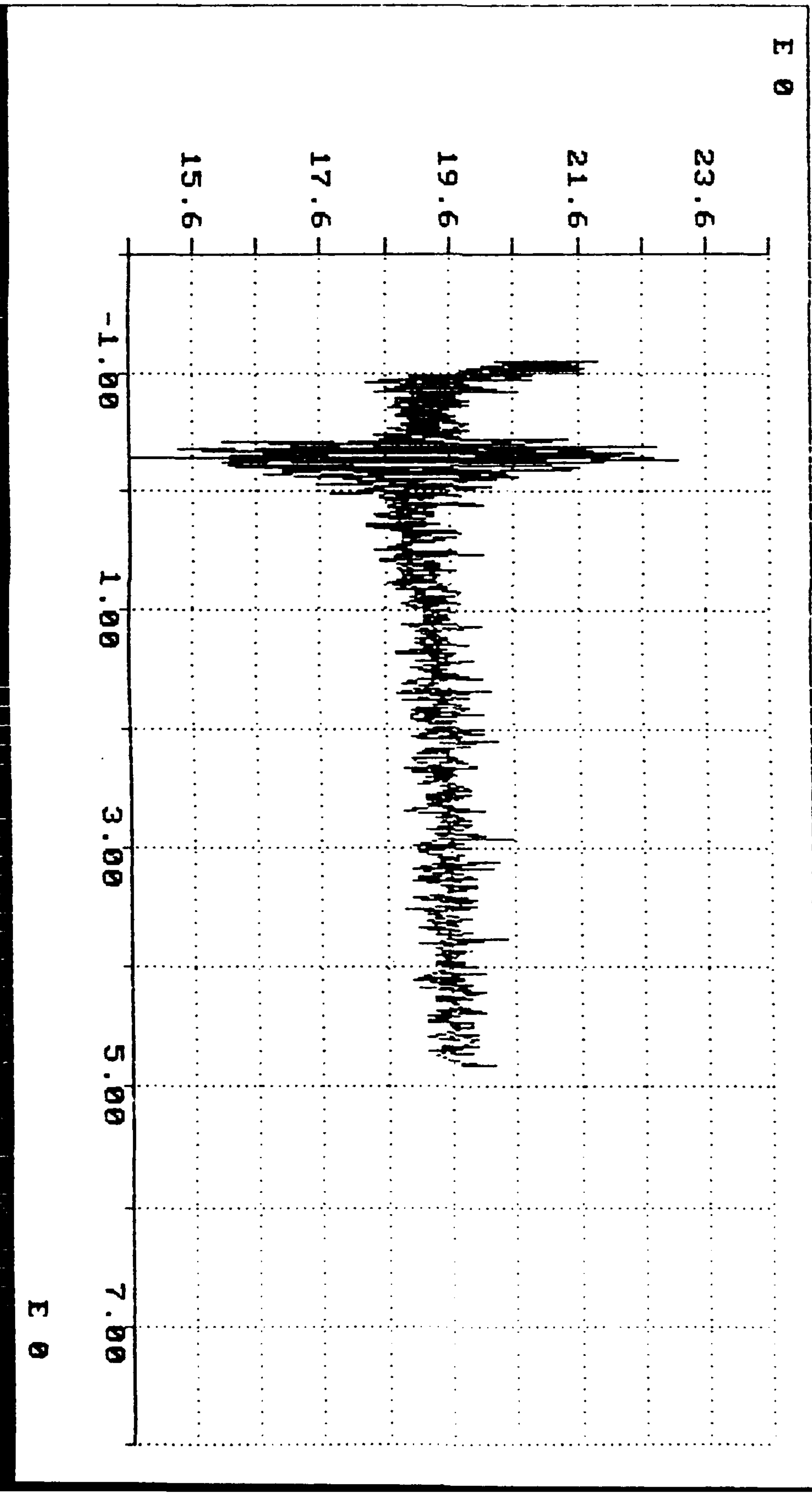
: 8 Comments Subfiles (Total #: 5) :

LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9

: 1> FERRONYL, 70 DEGREES, TC MAX=55, TC TOO D: Start# Shape #Repts :

: 2> WE HAVE A WELD : 1 2 × 256 5 :

AUG 28T



Fresh Bond

Ferronyl Temp = 70

File Input/Output

File Name: <B:AUG26U.JSR>

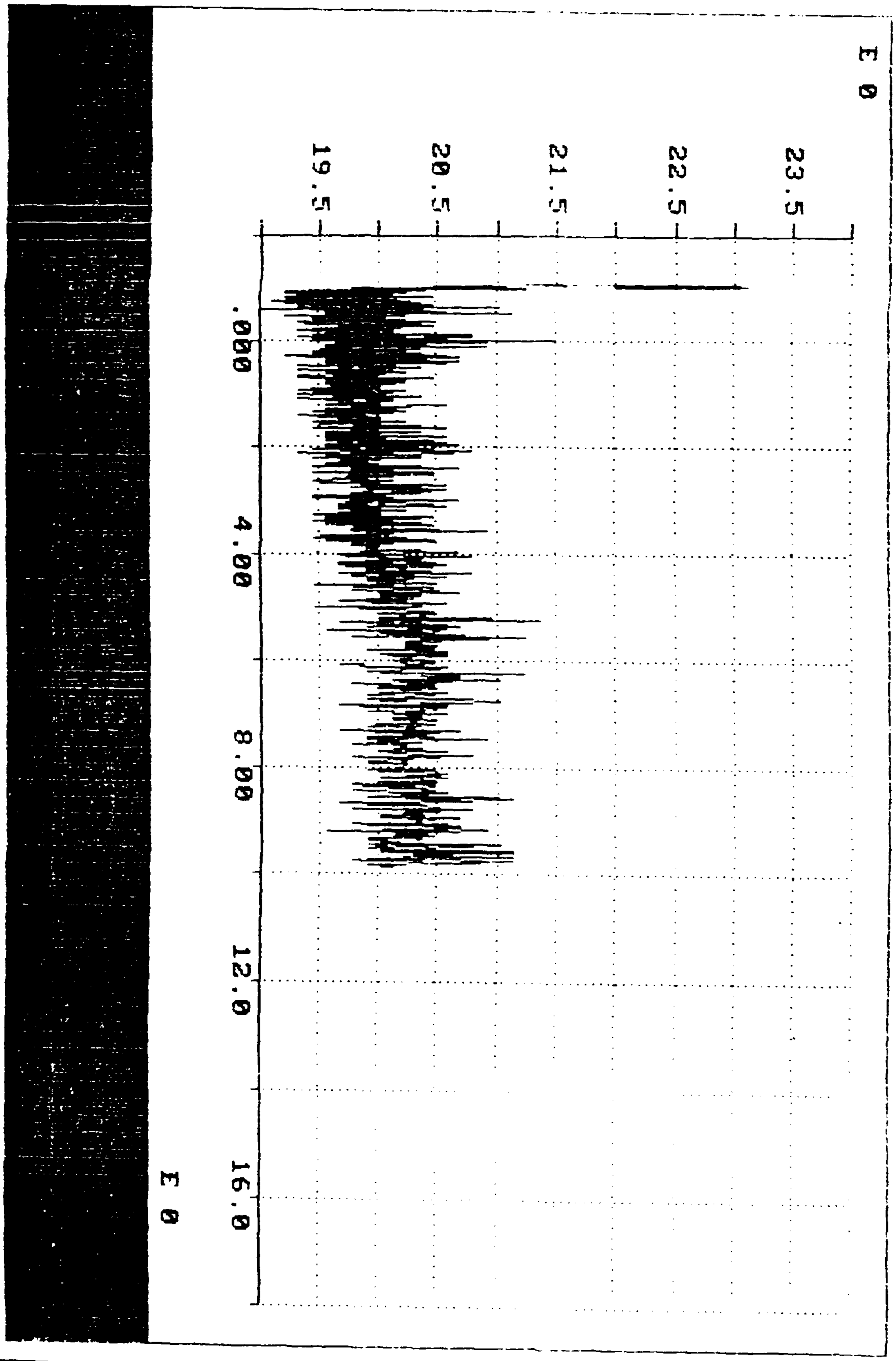
Quit/Continue: *

8 Comments

1> FERRONYL, TEMP SET AND CONTROLLED AT 80 D:
2> GES
3> LOOKED STRONGER THAN THE 70 DEGREE AND ST:
4> WELDS FROM THIS MORNING.

Subfiles (Total #: 7)

Start#	Shape	#Repts
1	2 × 256	7



AUG 28 4

Fresh Bowl
Ferronyl Temp = 80°C

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

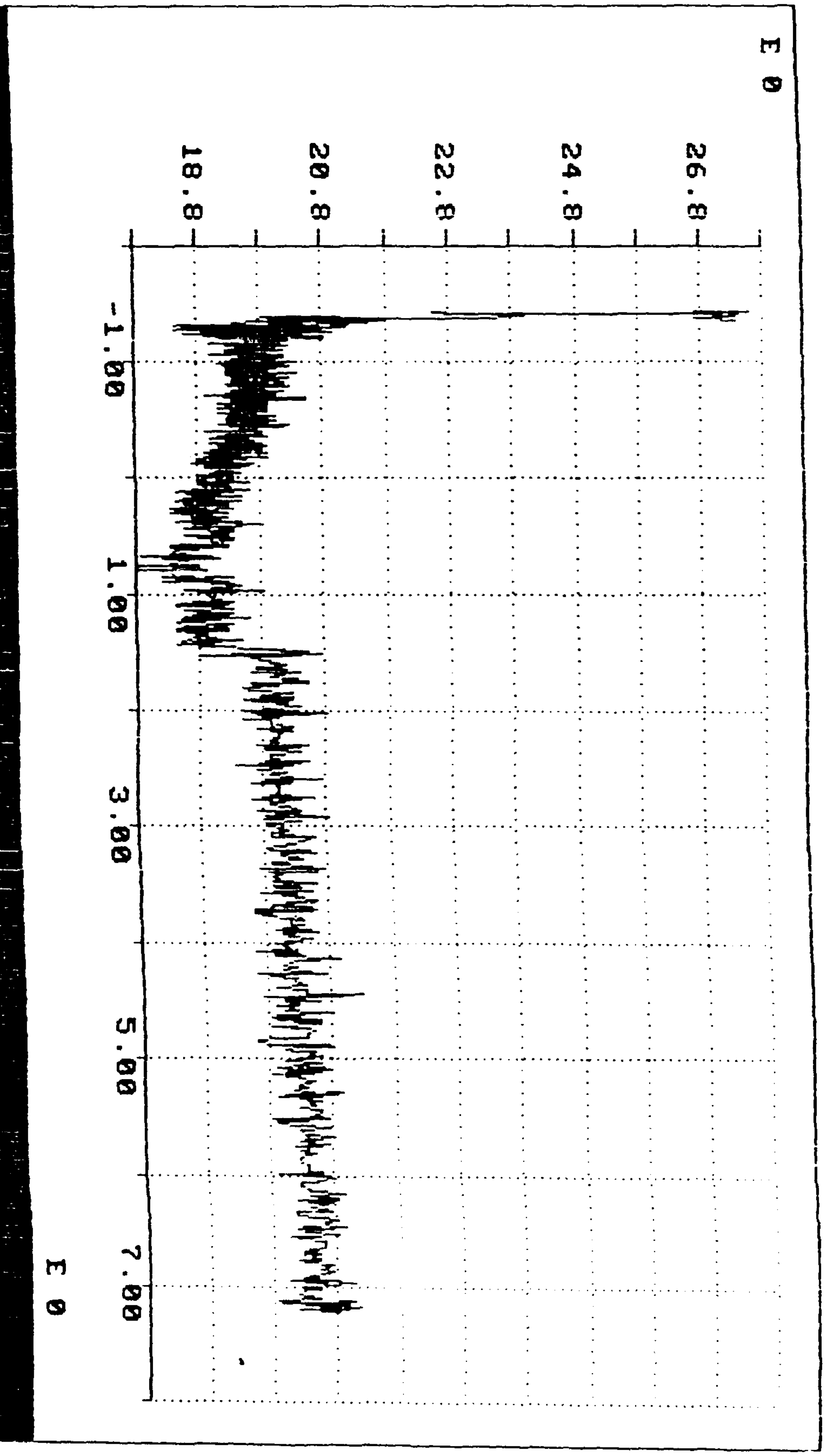
File Name: <B:AUG28K.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 7)

LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9

1> INDIA INK, 70 DEGREES (NOT REACHED) SOME :	Start#	Shape	#Repts :
2> WELDED, BROKE APART AT SEROSAL SURFACE. :	1	2 x 256	7 :
3> WELD SEEMED TO EXTEND THROUGHOUT TISSUE :			

AUG 28K



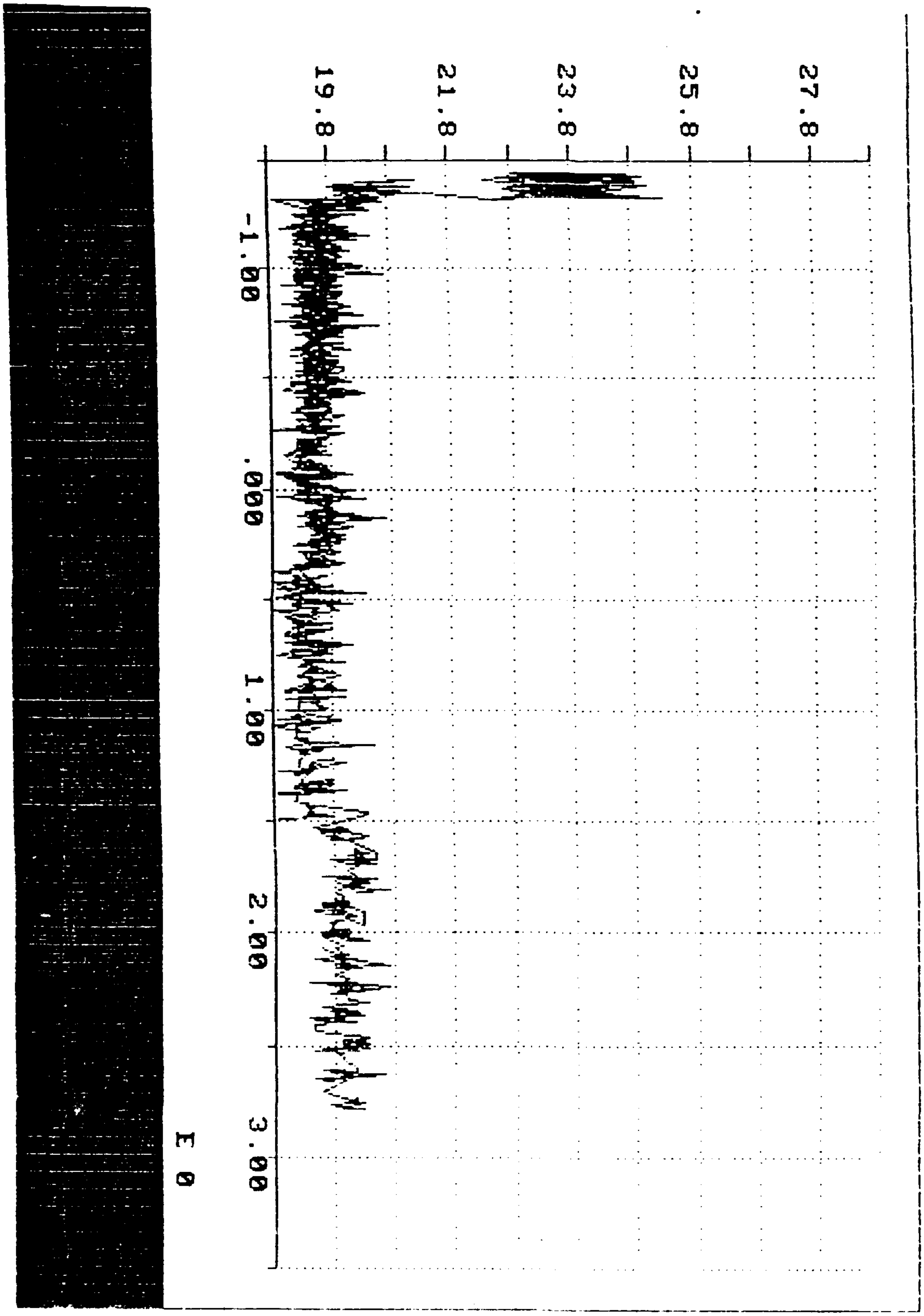
India Ink Temp - 70

File Input/Output

File Name: <B:AUG28L.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 6)

1> INDIA INK, TEMP = 80 DEGREES. TC MAX = 38:	Start#	Shape	#Repts
2> TISSUE BLANCHING AND SLIGHT SMOKE	1	2 x 256	6
3> OK WELD			



India Ink Temp=80

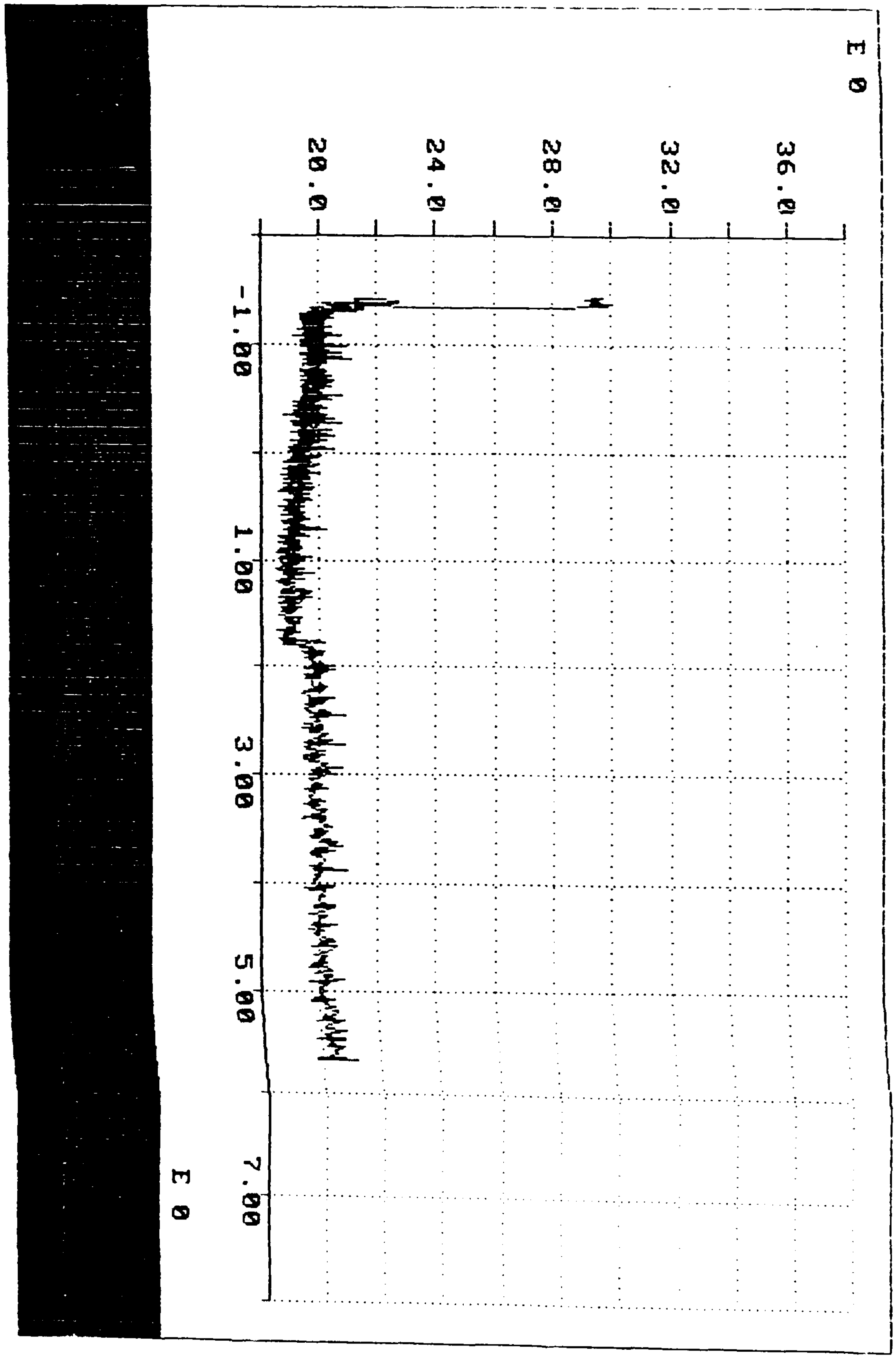
L

File Input/Output

File Name: <B:AUG28M.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 7)

1> INDIA INK, TEMPERATURE SET AT 100 AND CON:	Start#	Shape	#Repts
2> LOOKED LIKE A GOOD WELD	1	2 x 256	7



AUG28M

India Ink Temp=100

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

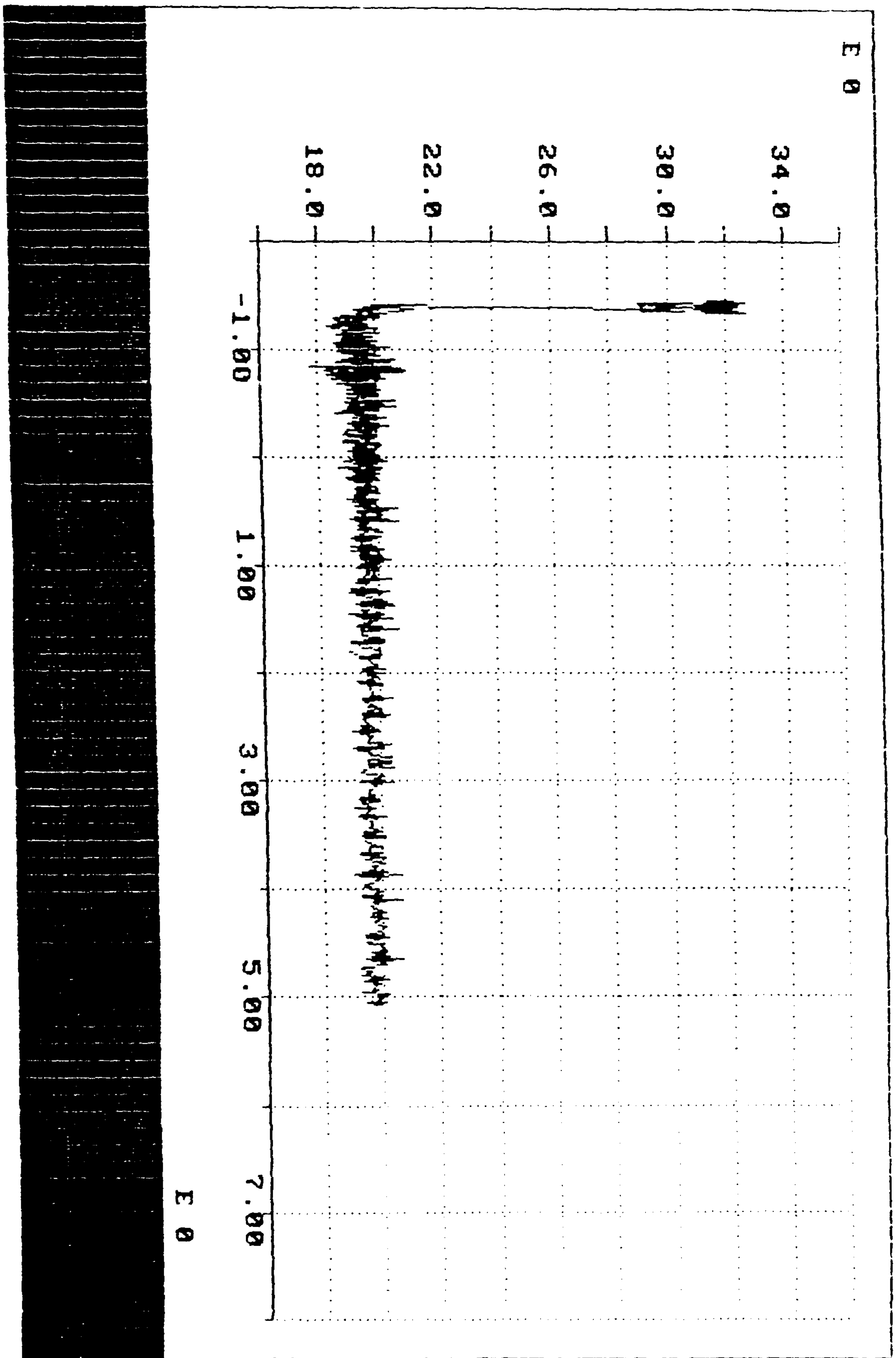
File Name: <B:AUG28N.USR>

Quit/Continue: *

Subfiles (Total #: 7)

8 Comments

	Start#	Shape	#Repts
1> FERRONYL TEMP = 50 CONTROLLED AT 41 DEGRE:	1	2 x 256	7
2> SOME BLANCHING LOOKS LIKE A WELD			



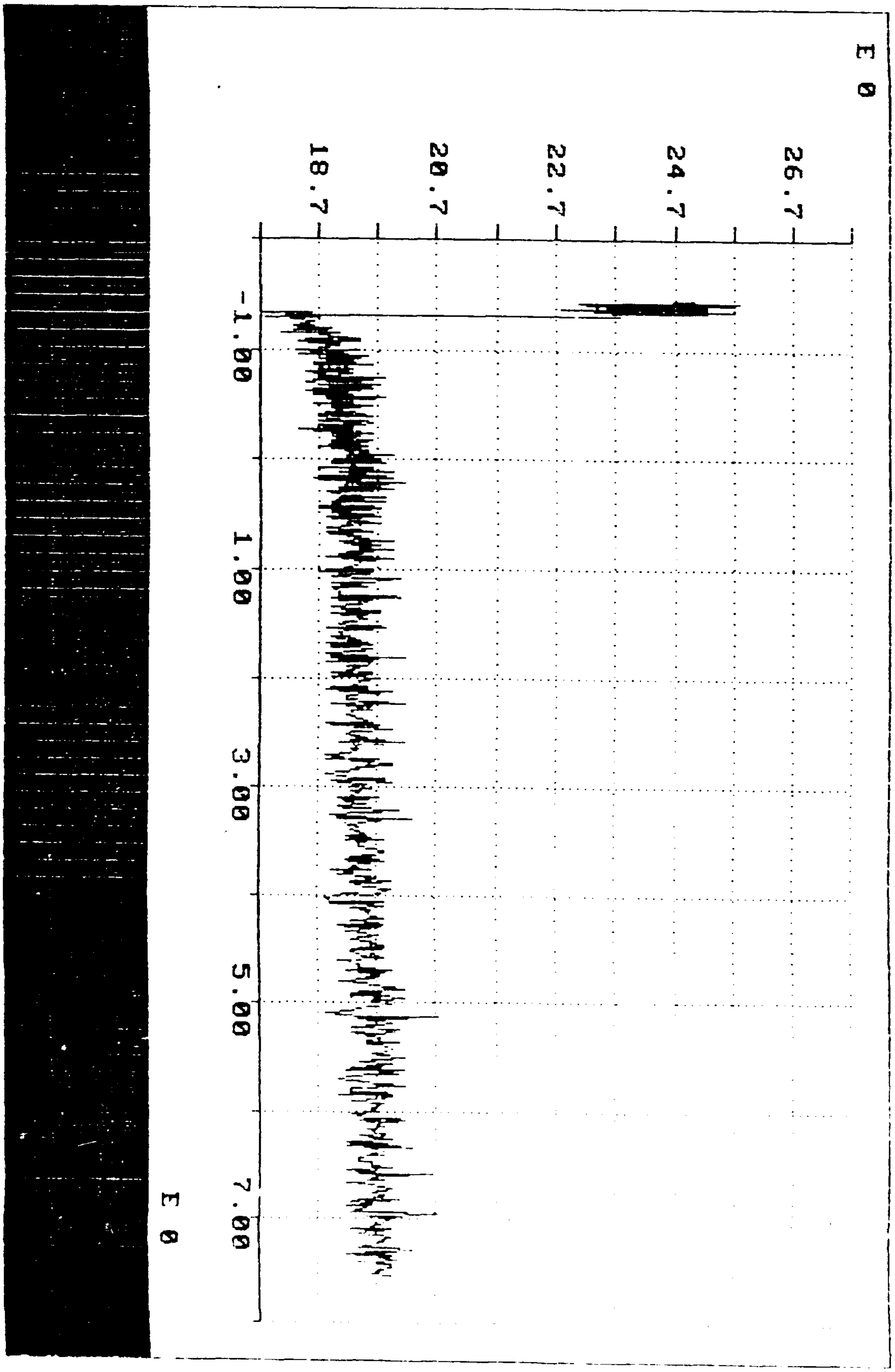
Ferronyl Temp = 50°C

File Input/Output

File Name: <B:AUG280.USR>   Quit/Continue: *

8 Comments   Subfiles (Total #: 8)

Comments	Start#	Shape	#Repts
1> FERRONYL, TEMP CONTROLLED AT 60 DEGREES			
2> BURLEIGH STAGE MAY NOT AHVE MOVED AT FIRS	1	2 x 256	8
3> WELD DID NOT LOOK VERY STRONG			
4>			



AUG280

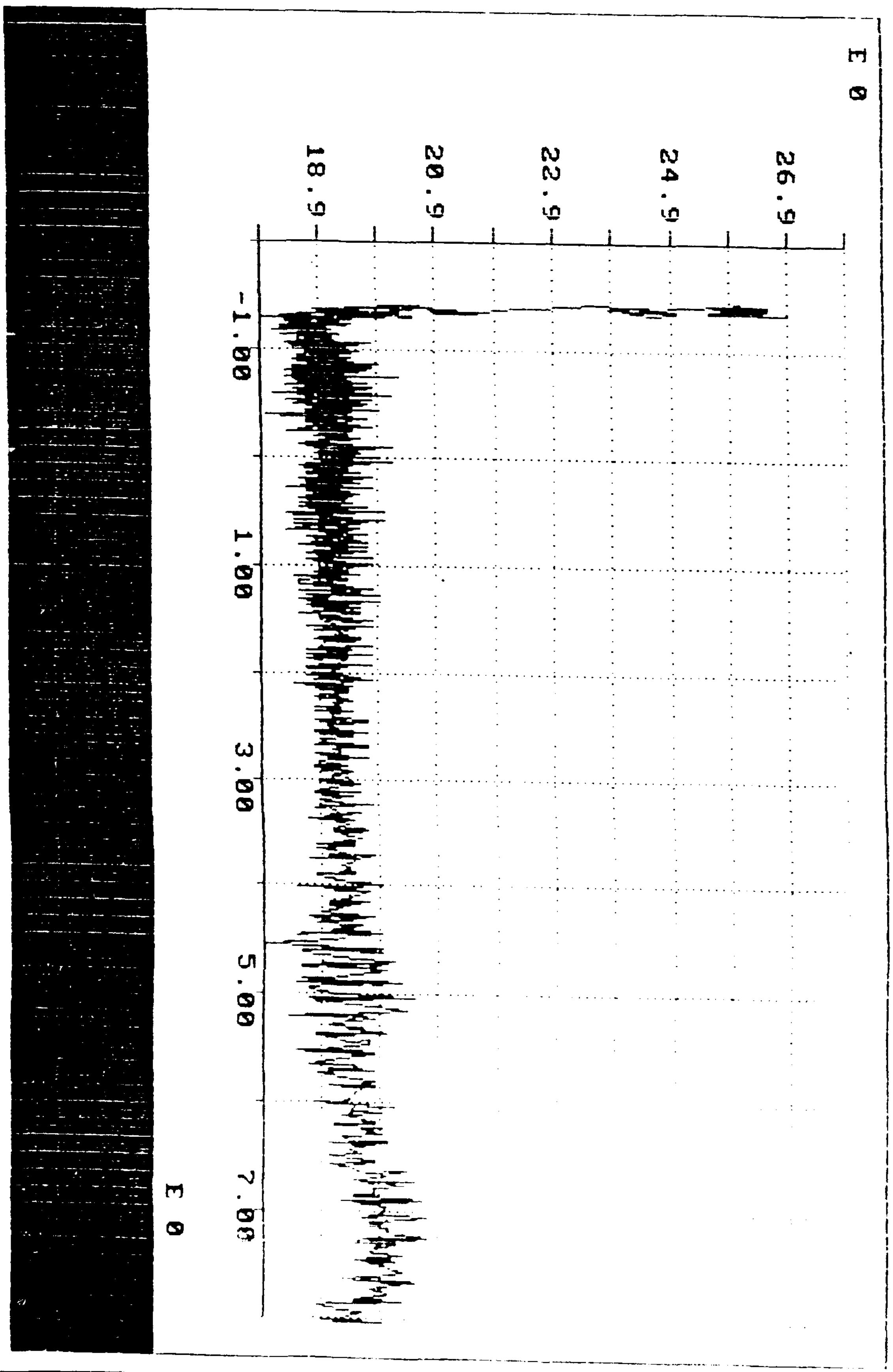
Ferronyl temp = 60

MMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output

File Name: <B:AUG28P.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 8)

1> FERRONYL 70 DEGREES LITTLE DESSICATION AN:	Start#	Shape	#Repts
2> A WELD, STRONGER THAN 60 DEGRES, BUT NOT	1	2 x 256	8
3> FERRONYL BARELY VISIBLE			



Ferronyl Temp = 70°C

File Input/Output

File Name: <B:AUG28E.USR>

Quit/Continue: *

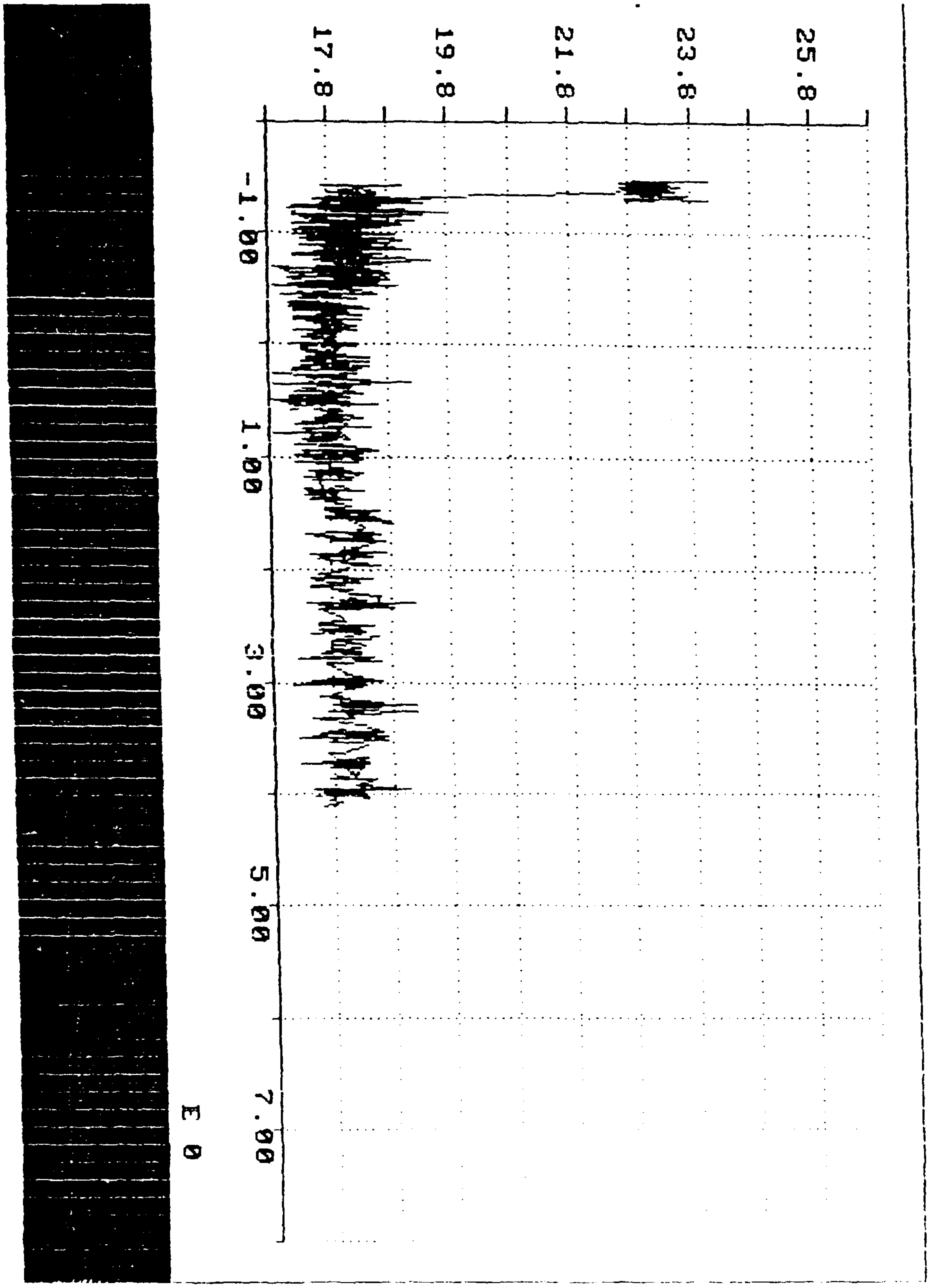
8 Comments

Subfiles (Total #: 5)

Start#	Shape	#Repts
1	2 x 256	5

1> FERRONYL COMPOUND
2> 18 SECONDS
3> SMOKED
4> WELDED OR STUCK TOGETHER

AUG 28 E



Ferronyl

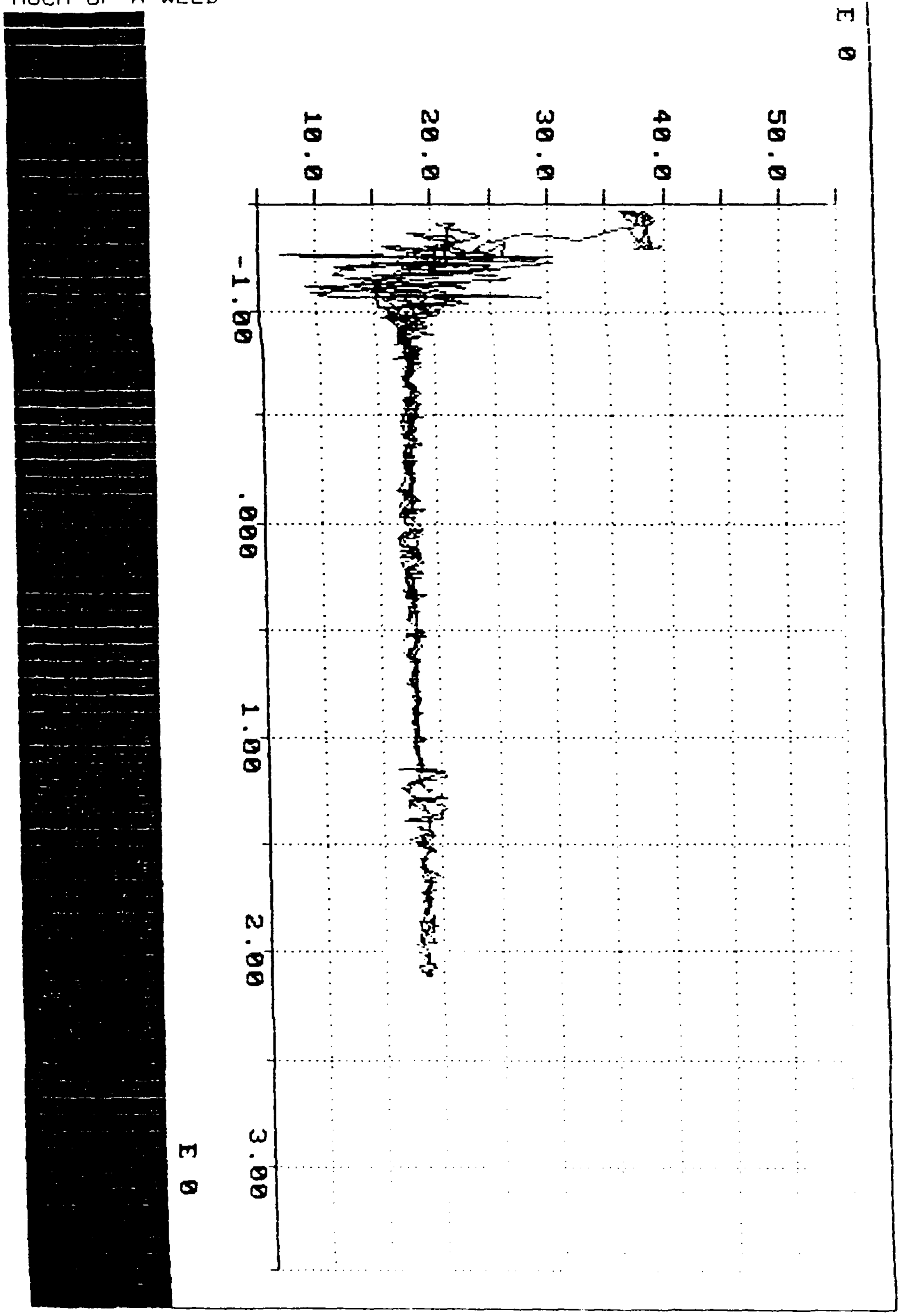
File Input/Output

File Name: <B:AUG28F.USR>   Quit/Continue: *

8 Comments   Subfiles (Total #: 4)

1> LIGHT INDIA INK, DRIED TISSUE, CONTROLLED: Start#   Shape   #Repts

2> NOT MUCH OF A WELD   : 1   2 x 256   4



AUG28F

light India ink
dried tissue

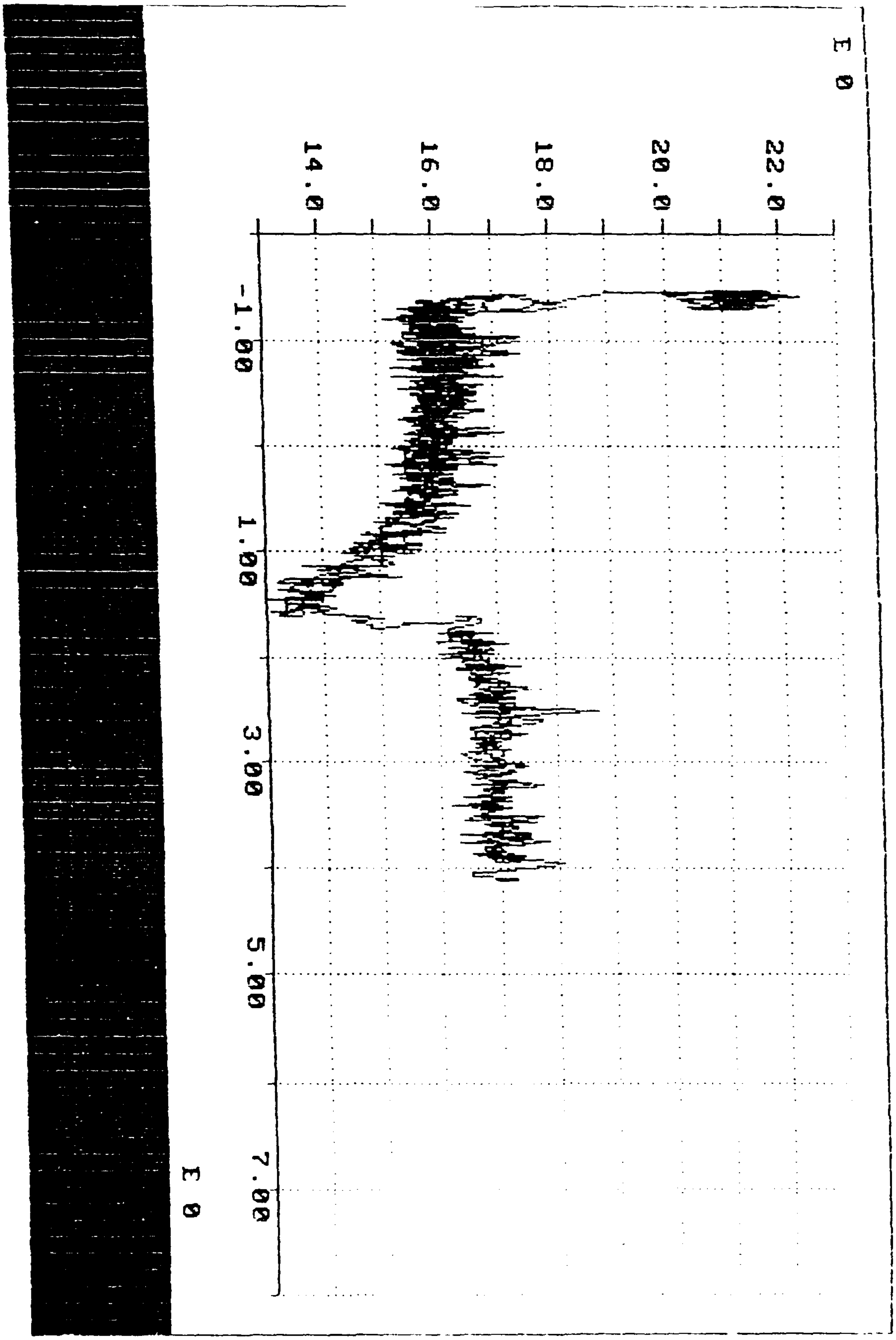
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

: File Name: <B:AUG28G.USR> Quit/Continue: * :

: 8 Comments Subfiles (Total #: 6) :

LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9

: 1> LIGHT INDIA INK, DRIED WITH Q TIP, NEW BO: Start# Shape #Repts :



AUG 28G

light india ink

new panel

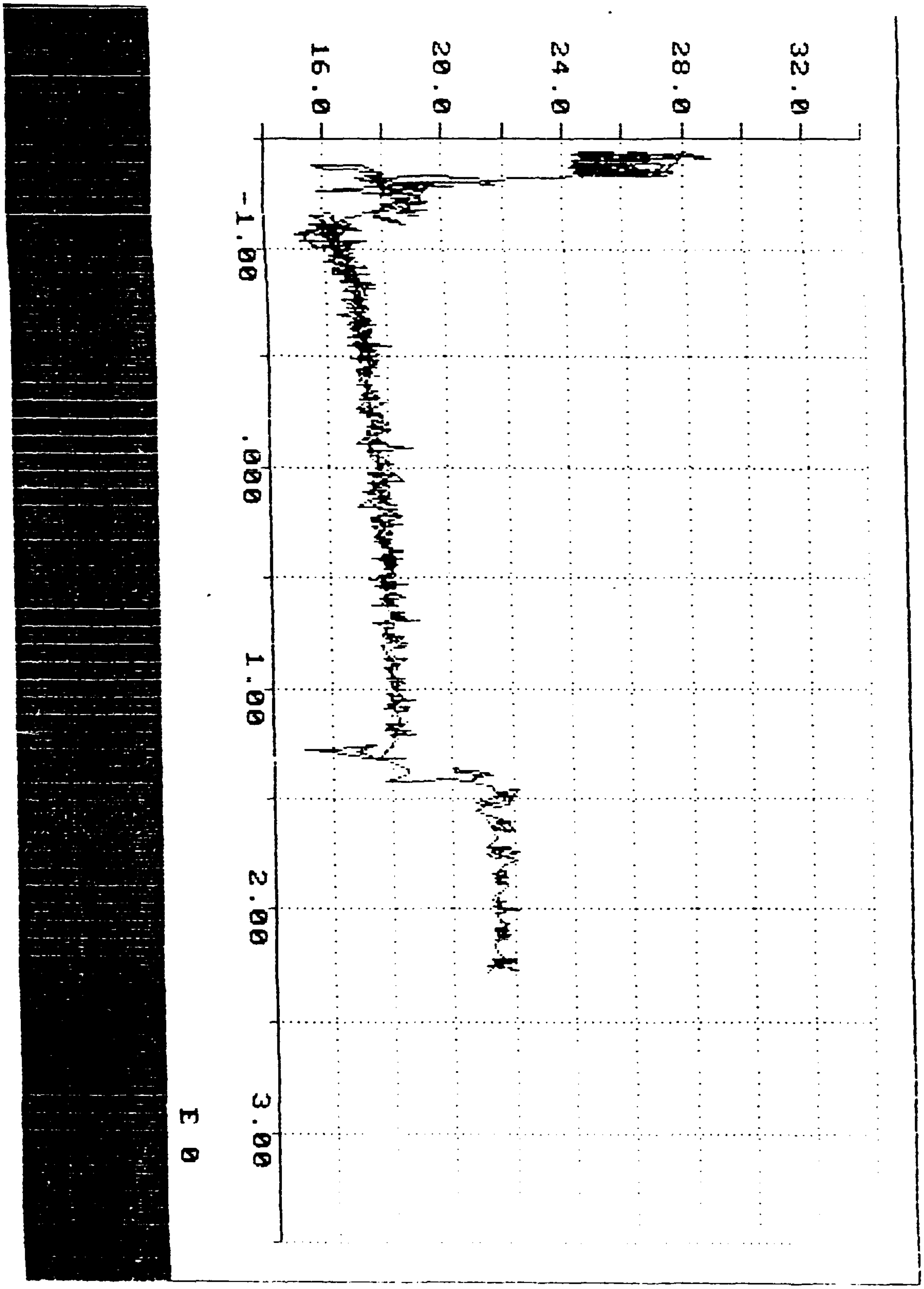
NO clamp

MMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

File Name: <B:AUG28H.USR>   Quit/Continue: *

8 Comments   Subfiles (Total #: 5)

1> NEW BOWEL WITH CLAMPS, LIGHT INDIA INK, D:	Start#	Shape	#Repts
2> THERMOCOUPLE PLACEMENT NOT CORRECT-ALIGNE:	1	2 x 256	5
3> CLAMPS ARE INTERFERING WITH EXPT.			



AUG 28 H

light India ink

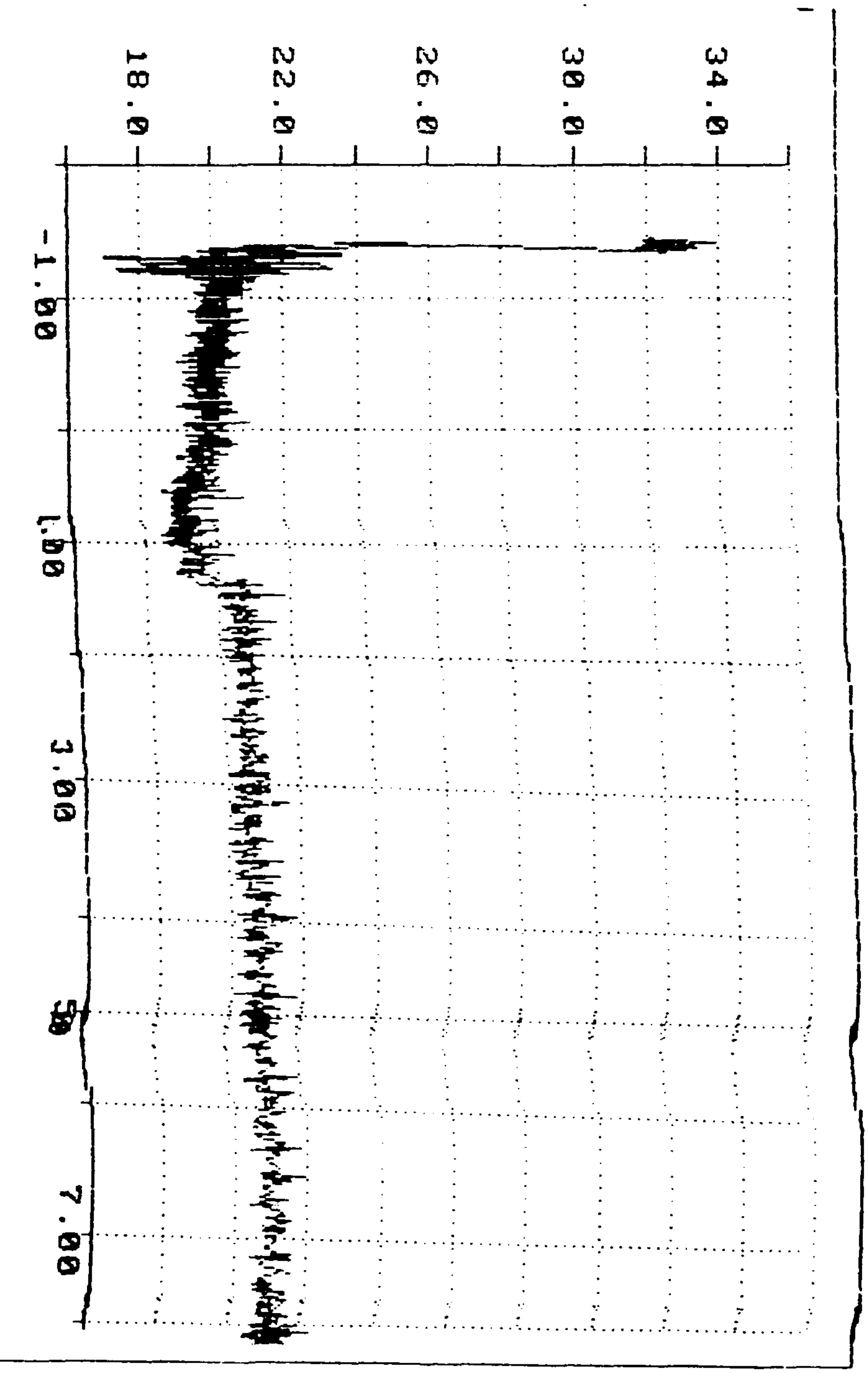
new bowel with clamp

File Input/Output

File Name: <B:AUG28I.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 8)

: 1> TEMP AT 50 DEGREES, LIGHT INDIA INK, NO C: Start# Shape #Repts :
: 2> WELDED : 1 2 x 256 8



India ink Temp = 50

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM :

: File Name: <B:AUG28J.USR> Quit/Continue: * :

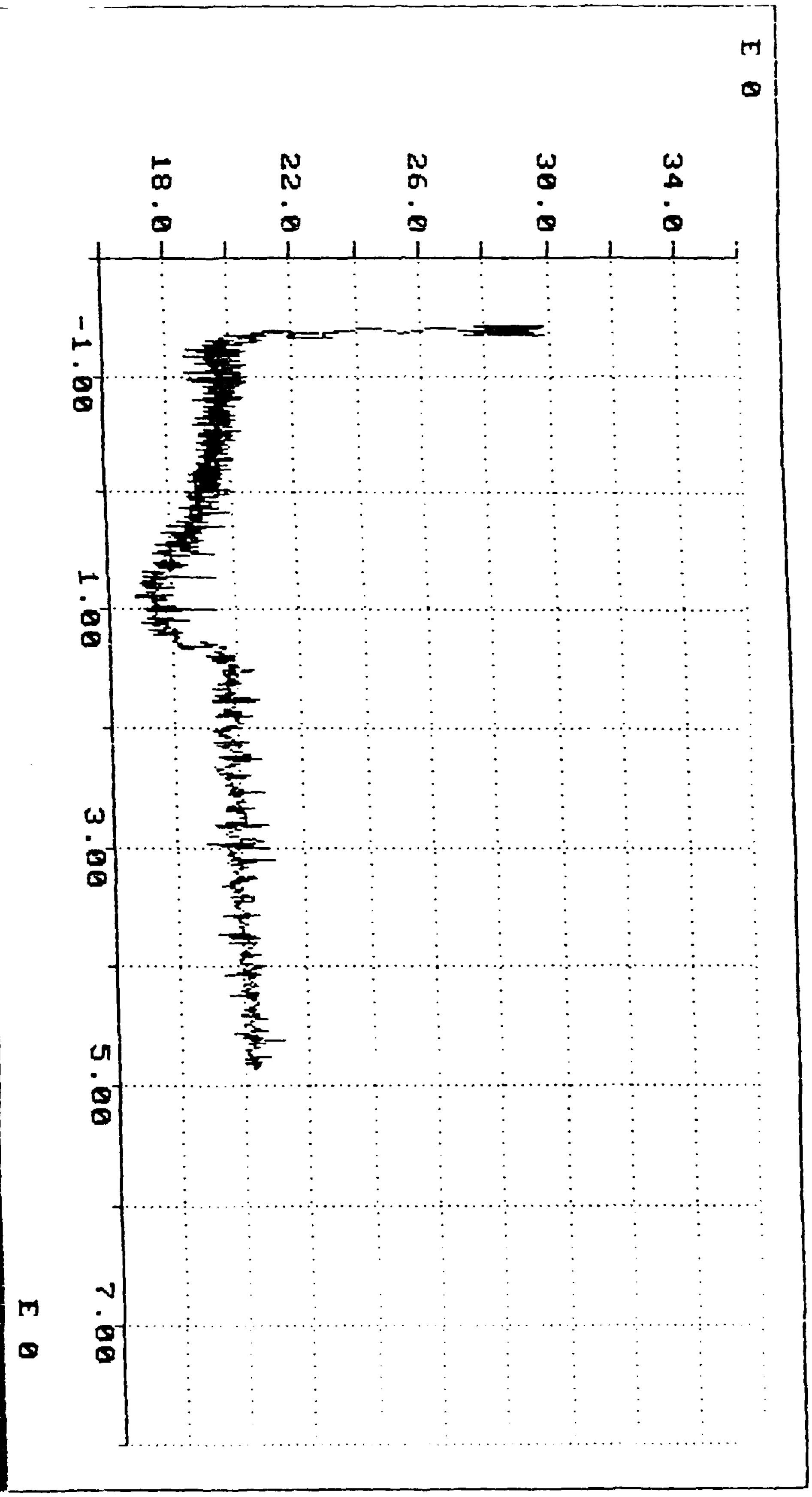
: Subfiles (Total #: 6) :

: 8 Comments

LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

: 1> INDIA INK, TEMP = 60 DEGREES, SLIGHT DESS: Start# Shape #Repts :

: 2> LOOKS LIKE A WELD, TORE AT SEROSAL SURFCE: 1 2 x 256 6 :



AUG 28 J

India Ink Temp = 60

File Input/Output

File Name: <B:AUG28B.USR>

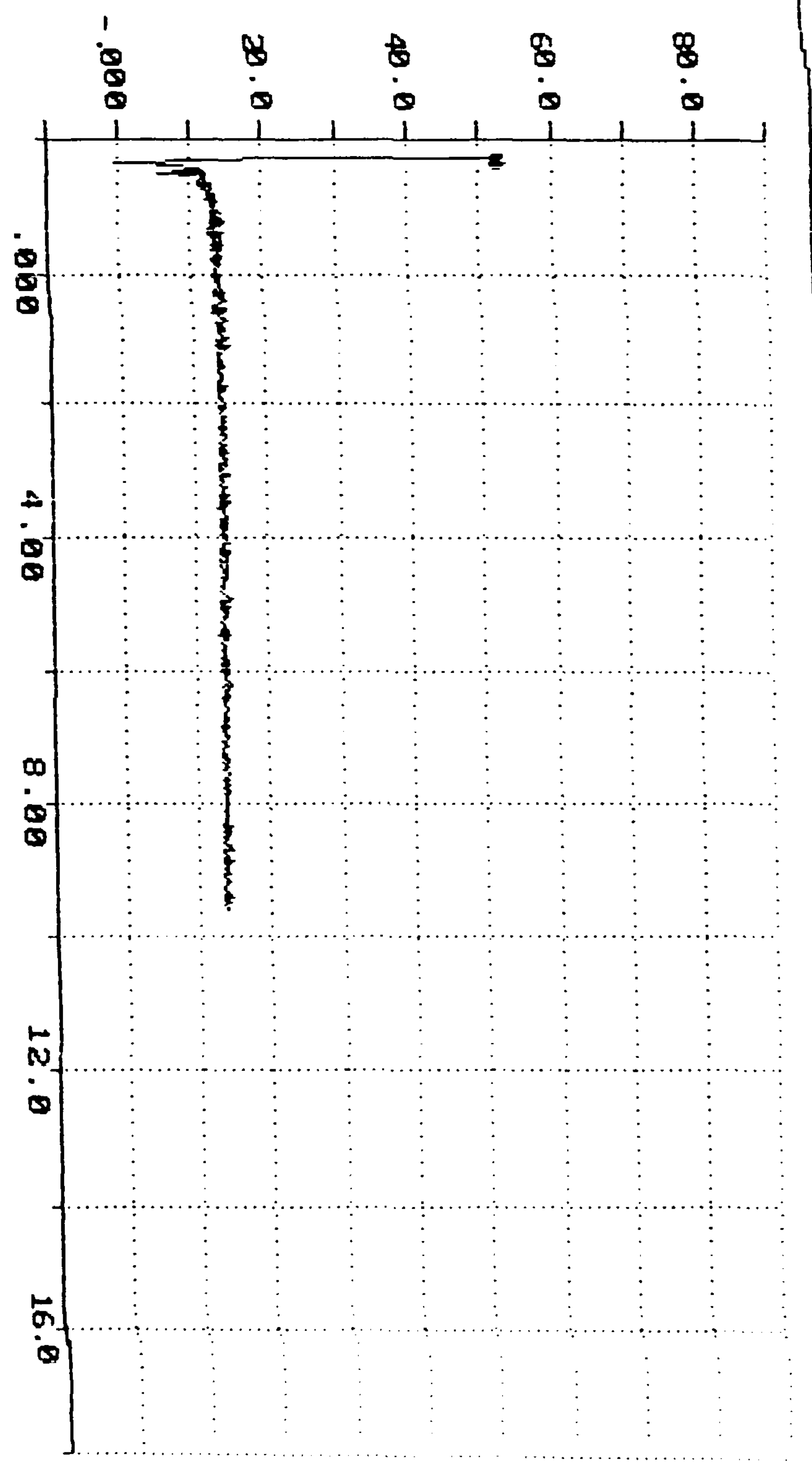
Quit/Continue: *

8 Comments

Subfiles (Total #: 5)

> TWO STRIP CONTROL

Start#	Shape	#Repts
1	2 x 256	5



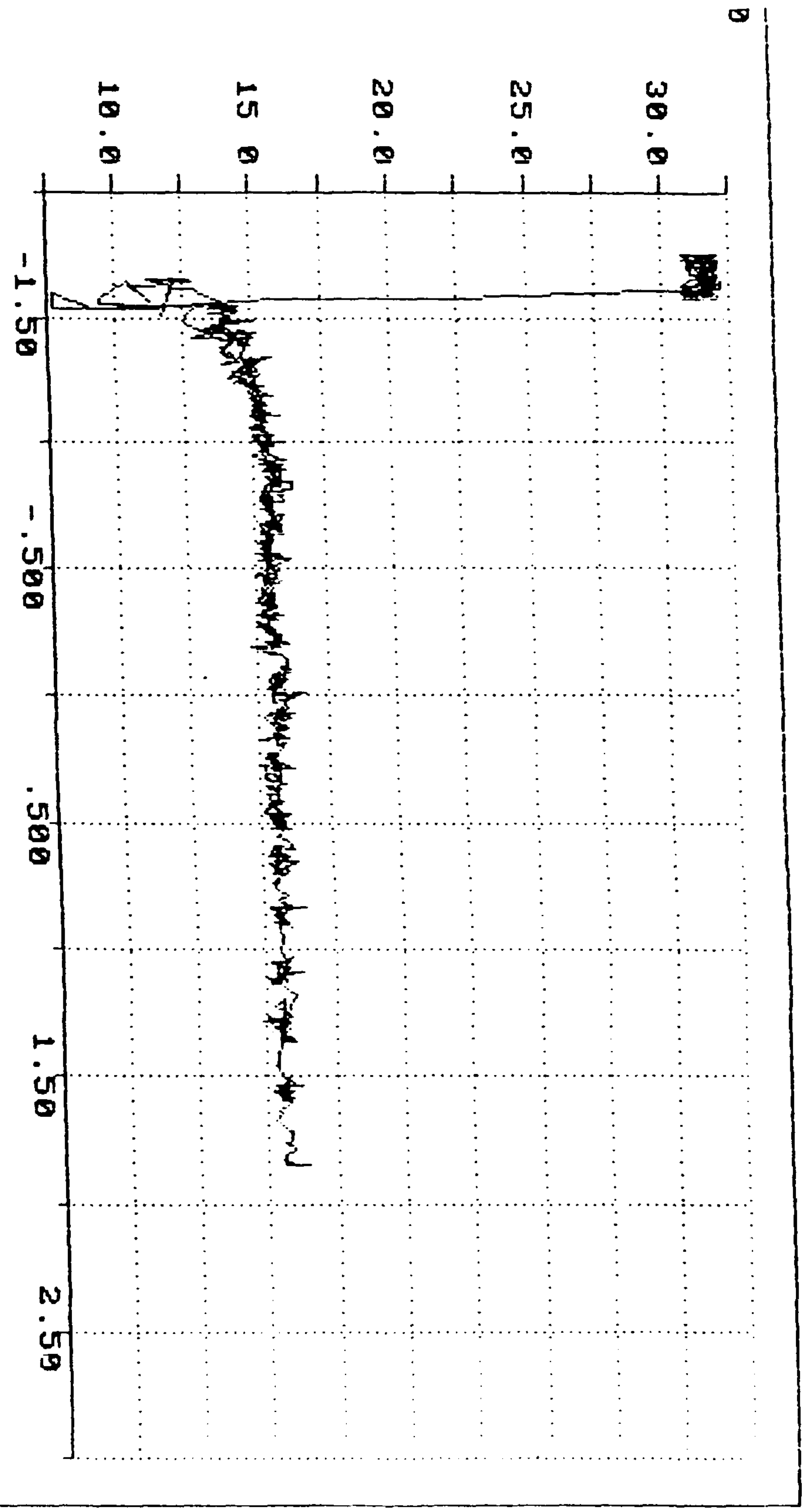
2 strip control

File Input/Output

File Name: <B:AUG28C.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 4)

LASER CONTROL	Start#	Shape	#Repts
2> DID NOT LOOK LIKE MUCH OF A WELD	1	2 x 256	4



laser control - 2 strips

File Input/Output

File Name: <B:AUG28D.USR> Quit/Continue: *

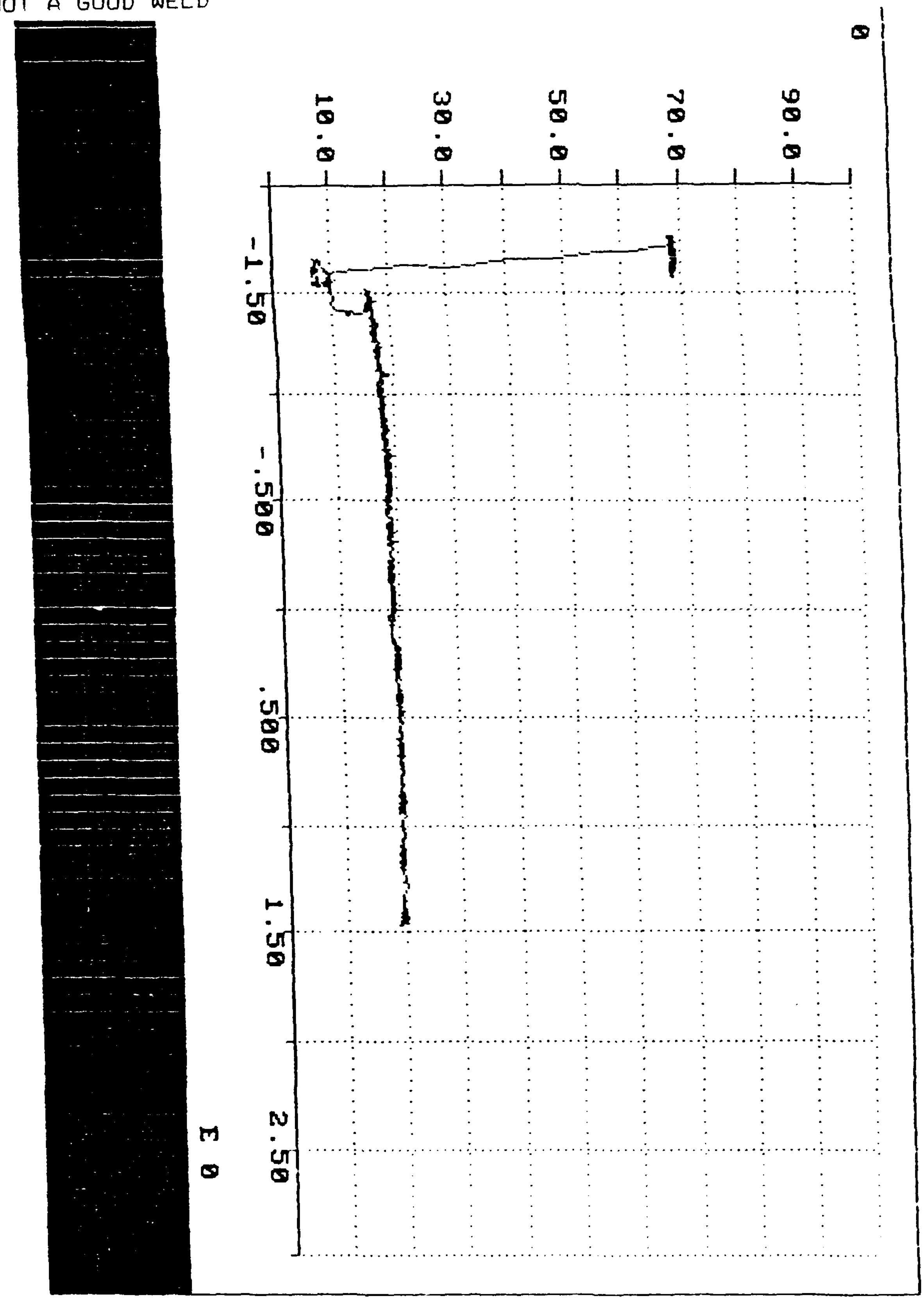
Subfiles (Total #: 4)

8 Comments

: Start#	Shape	#Repts
1	2 x 256	4

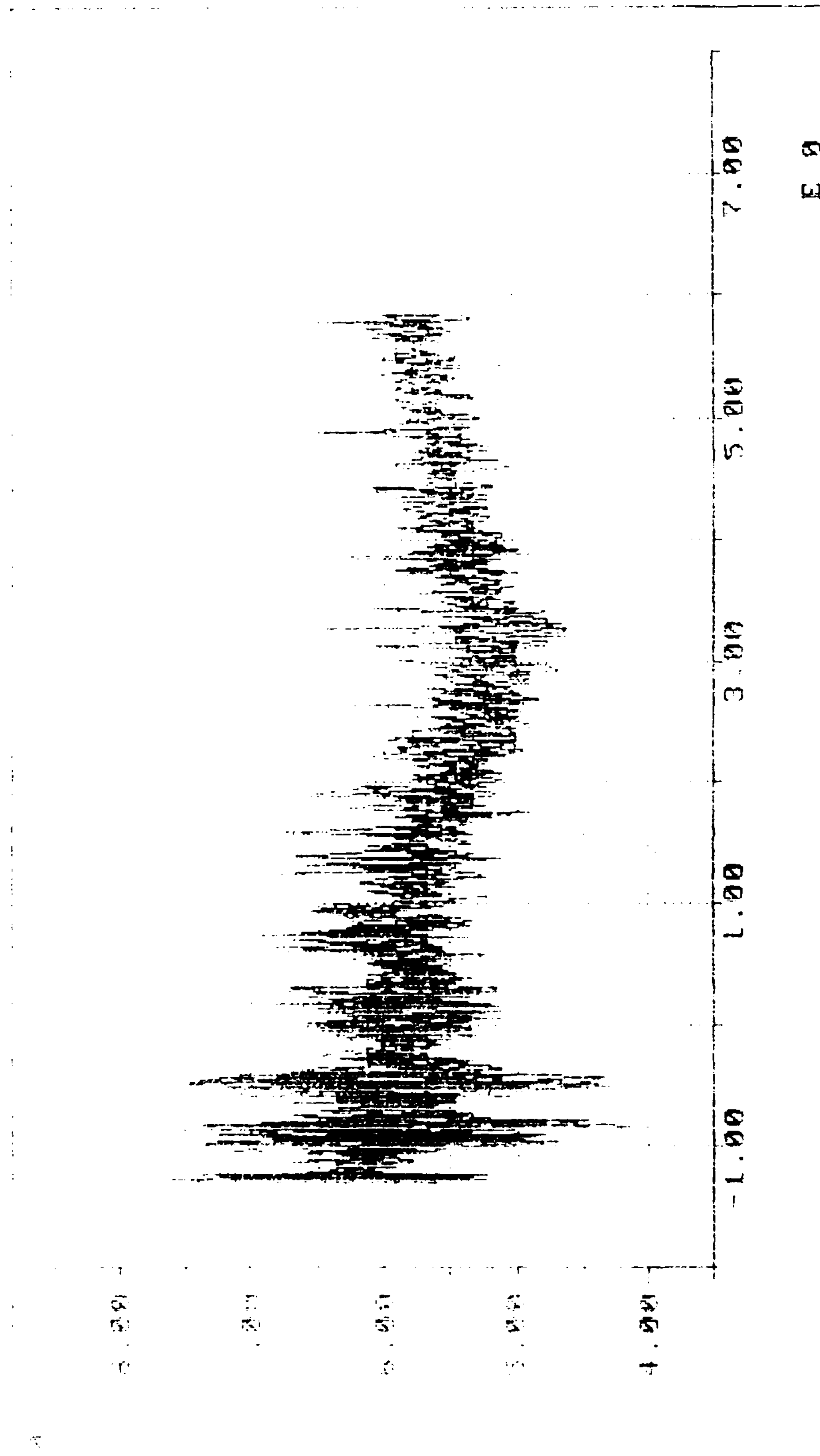
INDIA INK LIGHT
NOT A GOOD WELD

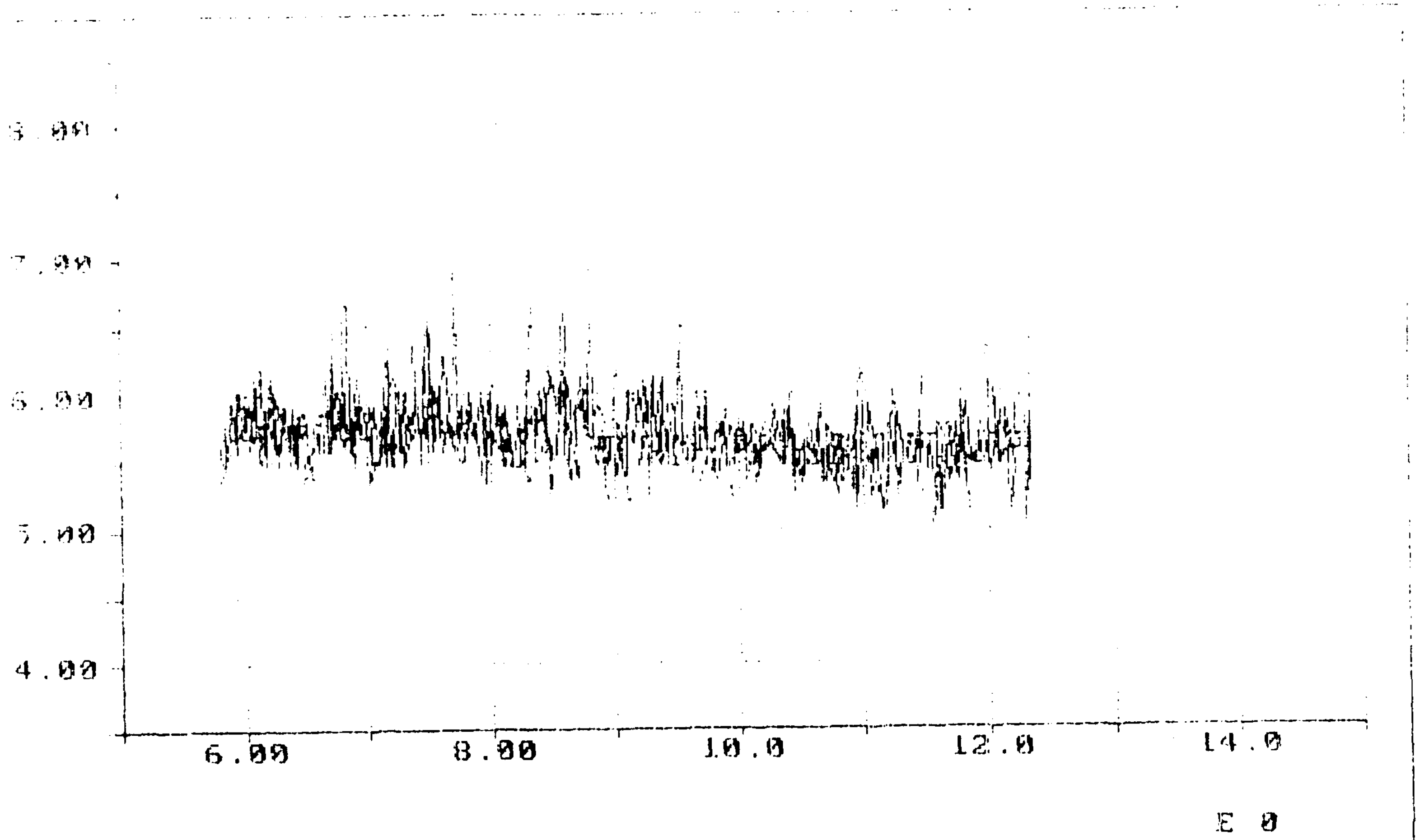
Aug 28D

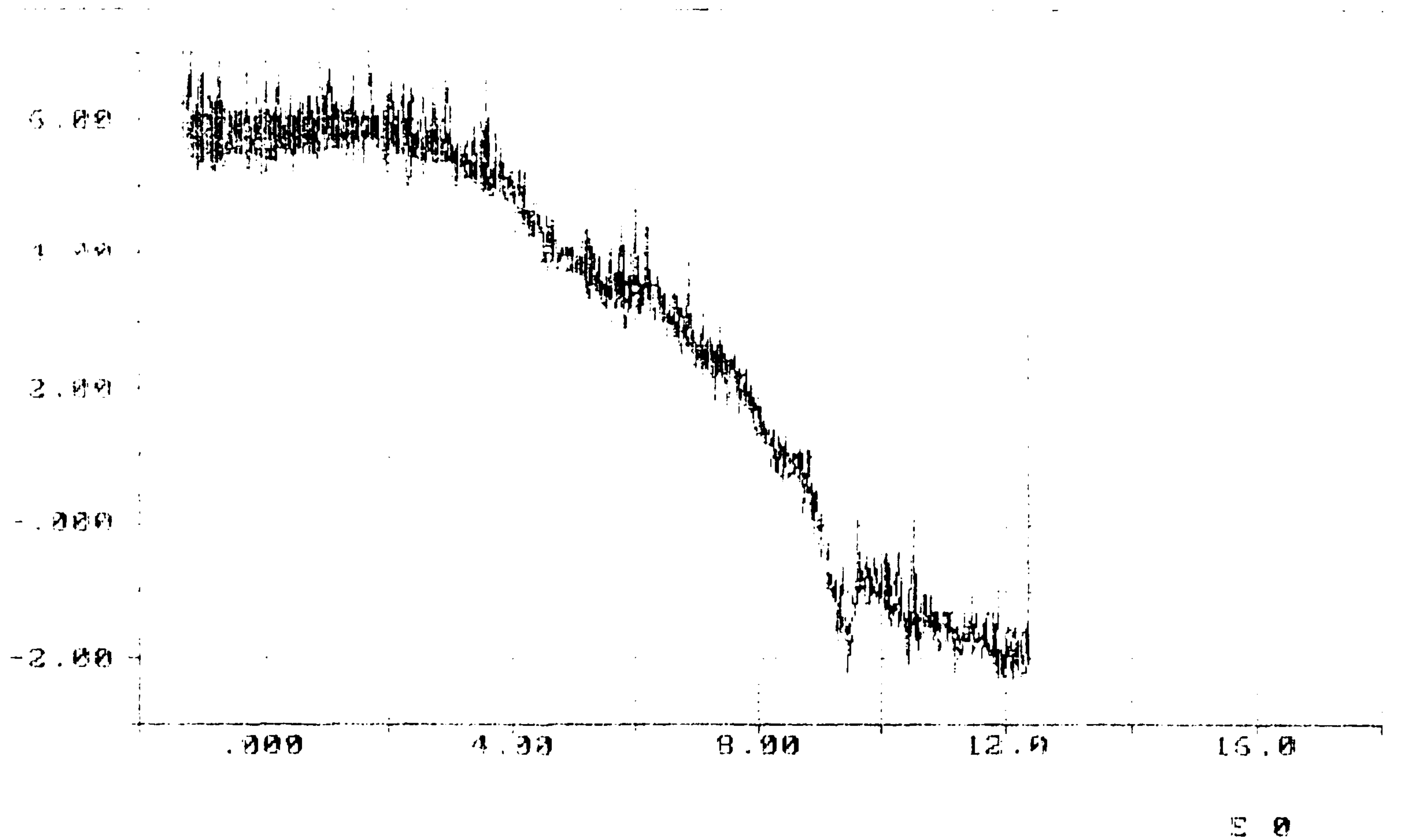


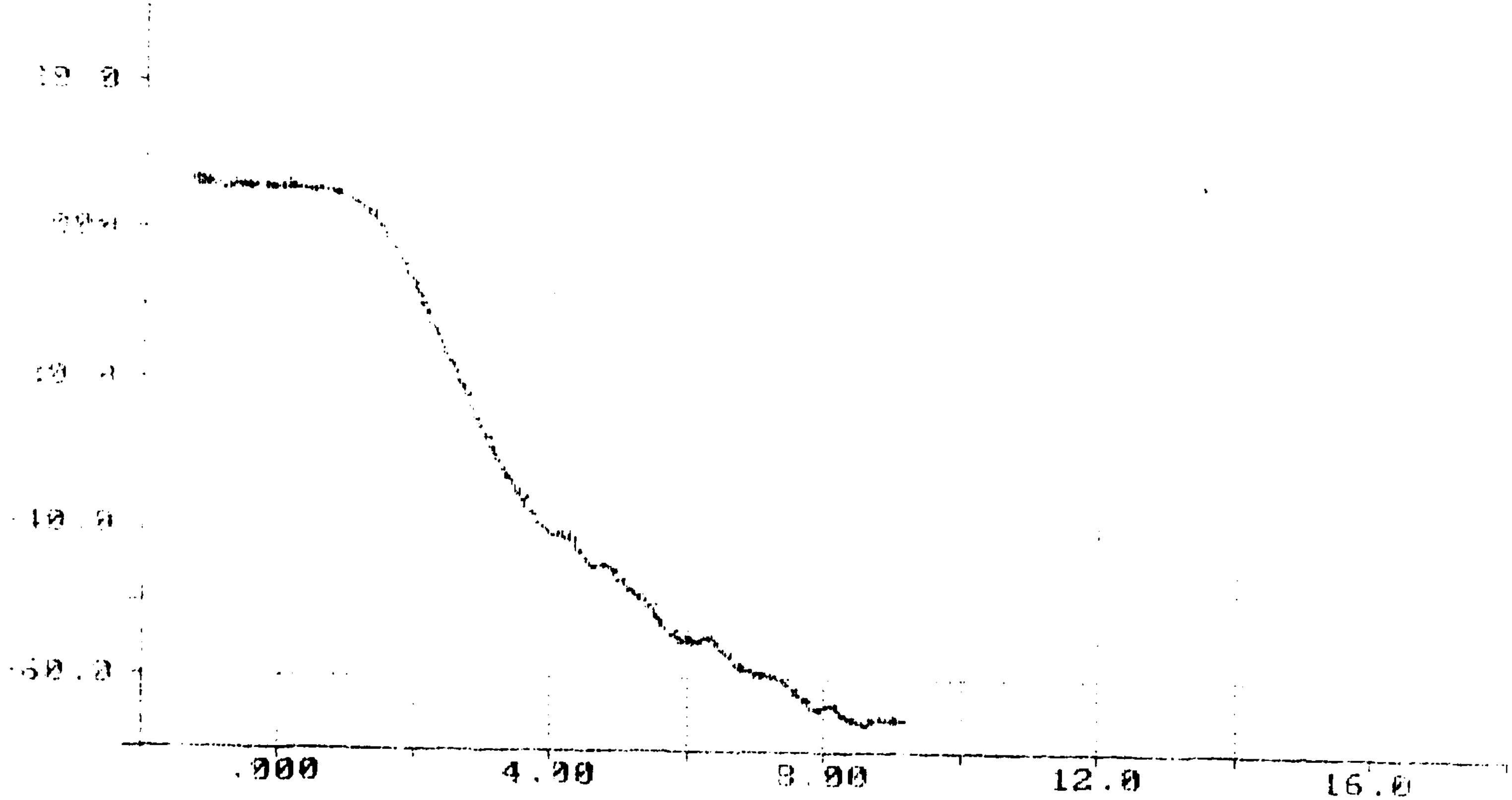
India ink (light)

9-5-90

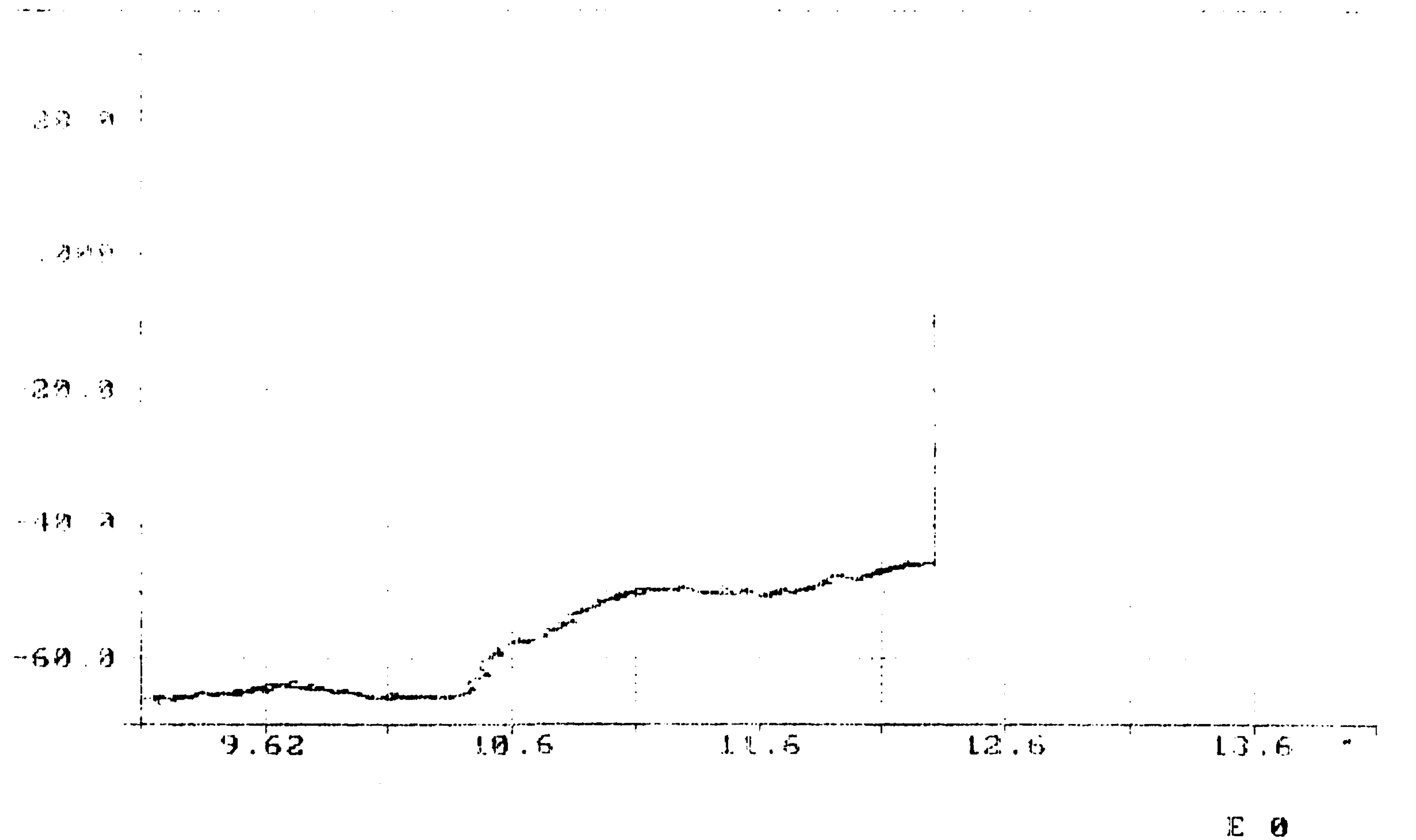



8.00
7.00
6.00
5.00
4.00
6.00
8.00
10.0
12.0
14.0
E 0

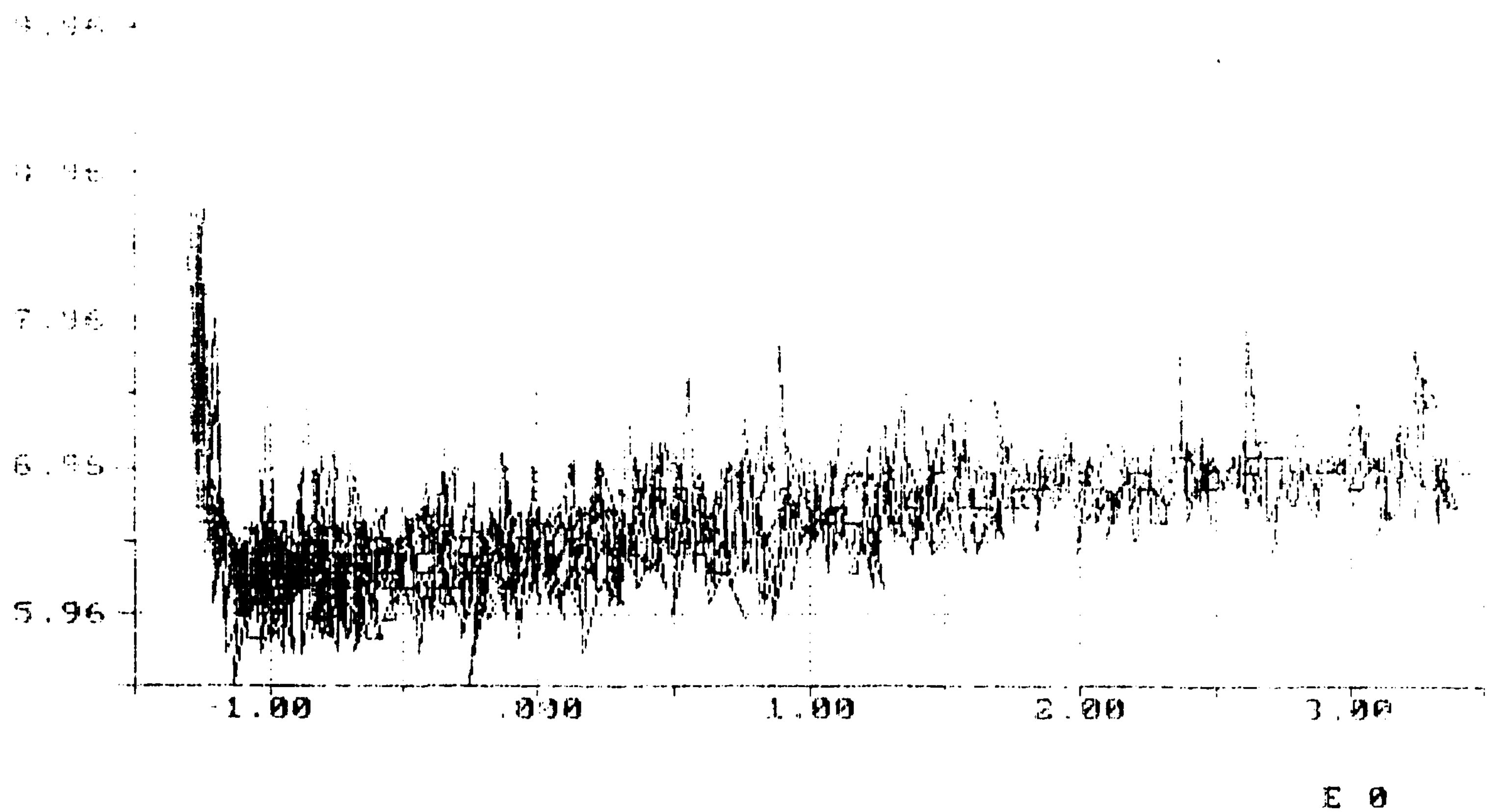

2.00
-2.00
.000
4.00
8.00
12.0
16.0
E 0

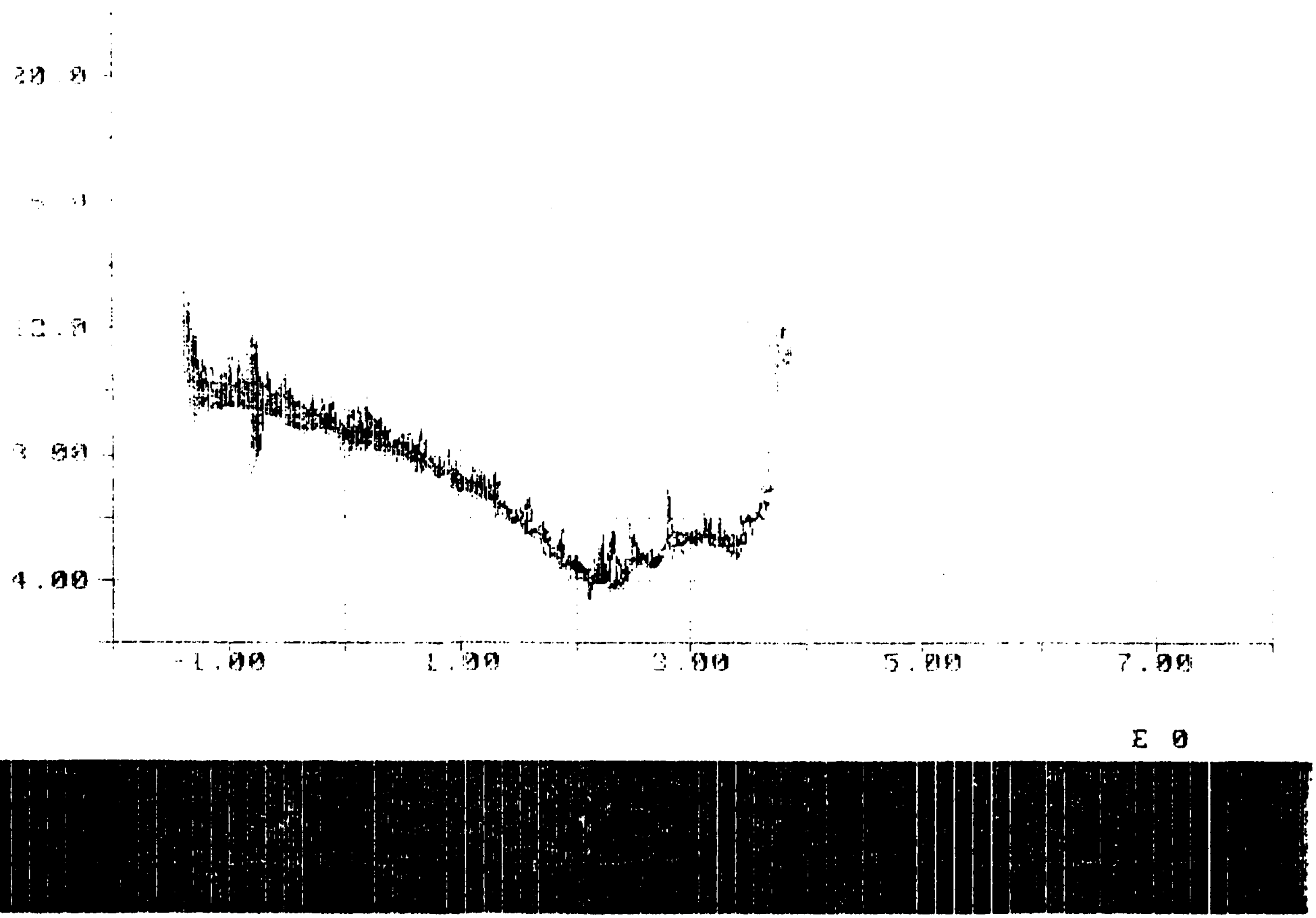


E 0

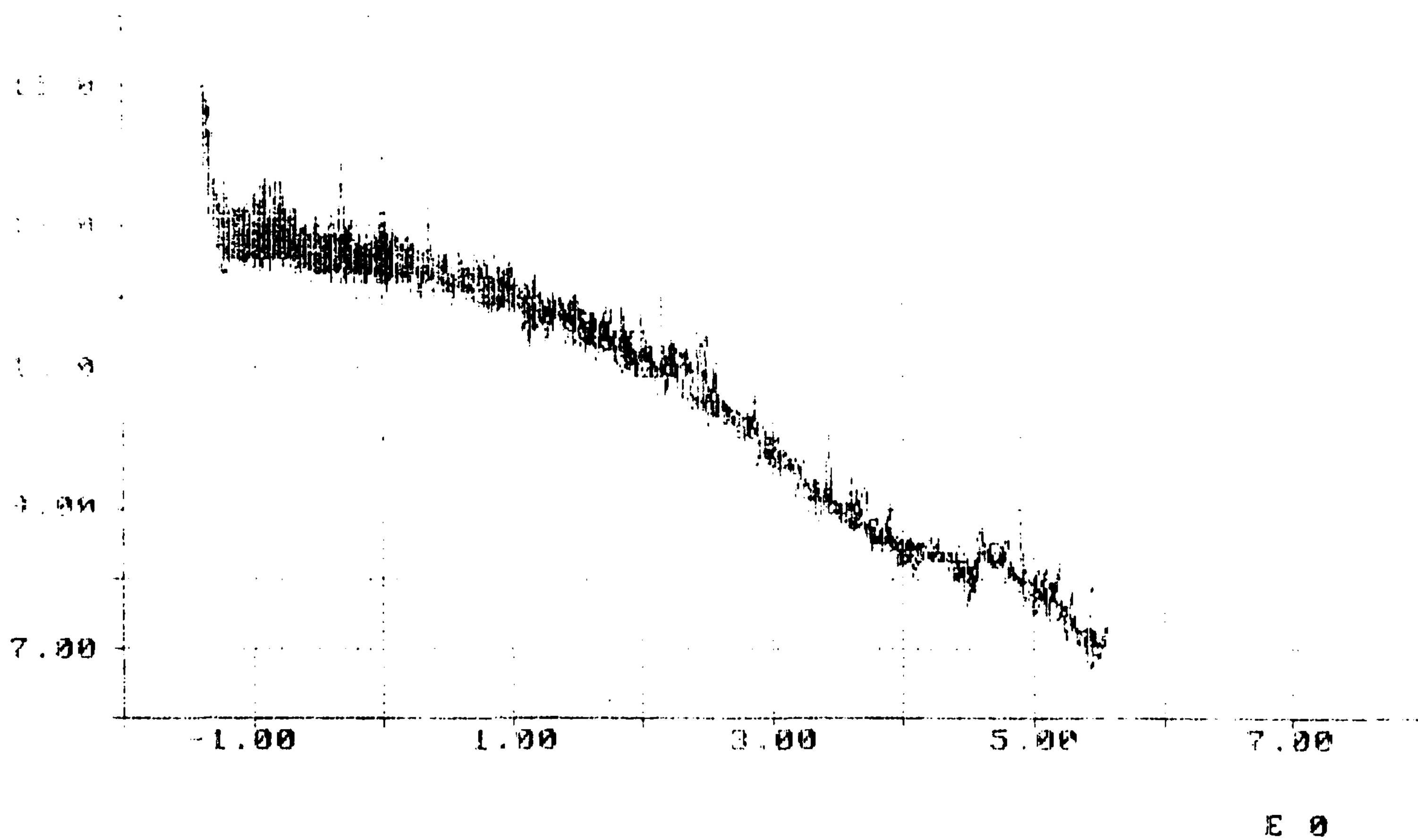


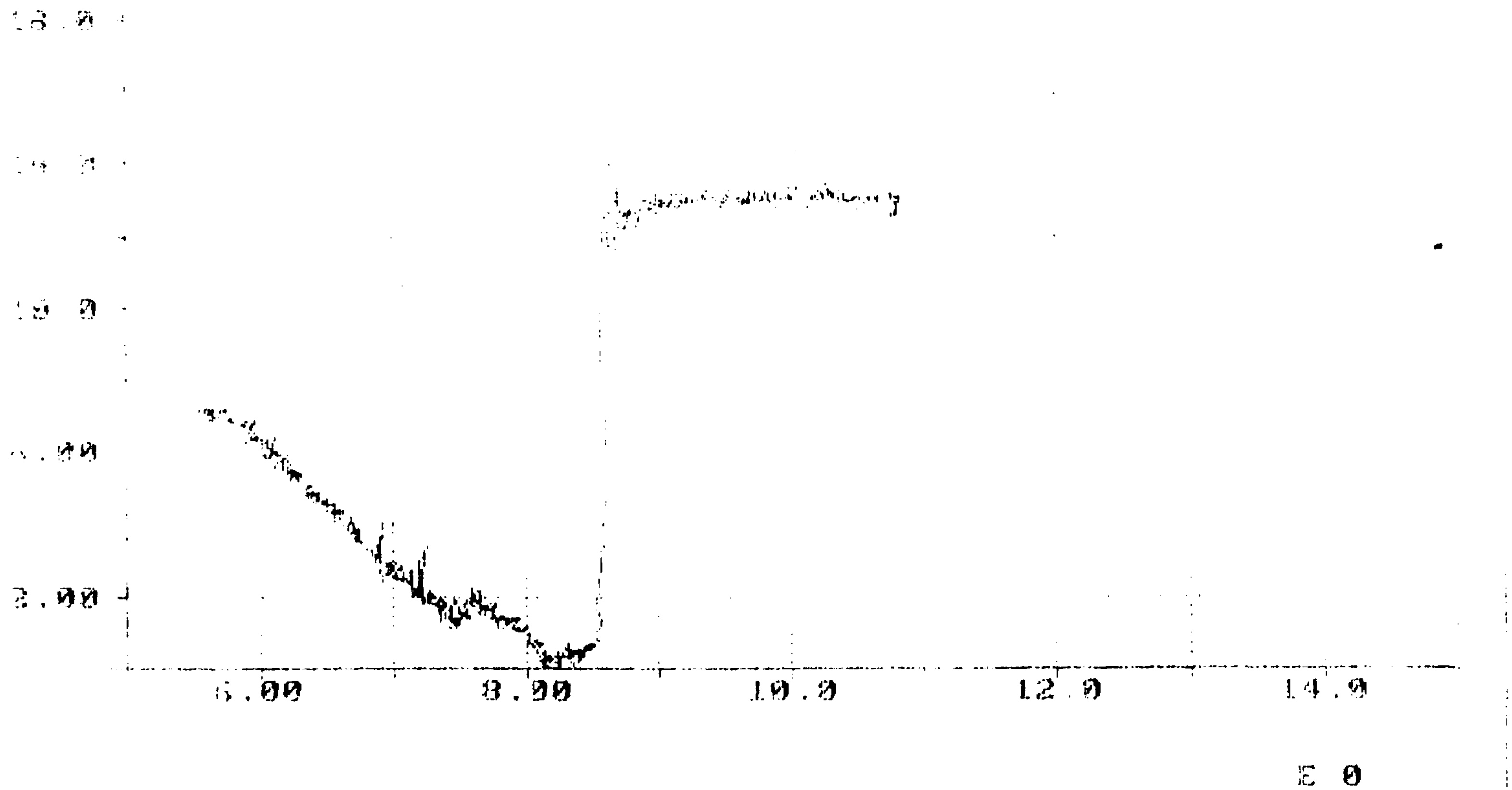
-20.0
-40.0
-60.0
9.62
10.6
11.6
12.6
13.6
E 0

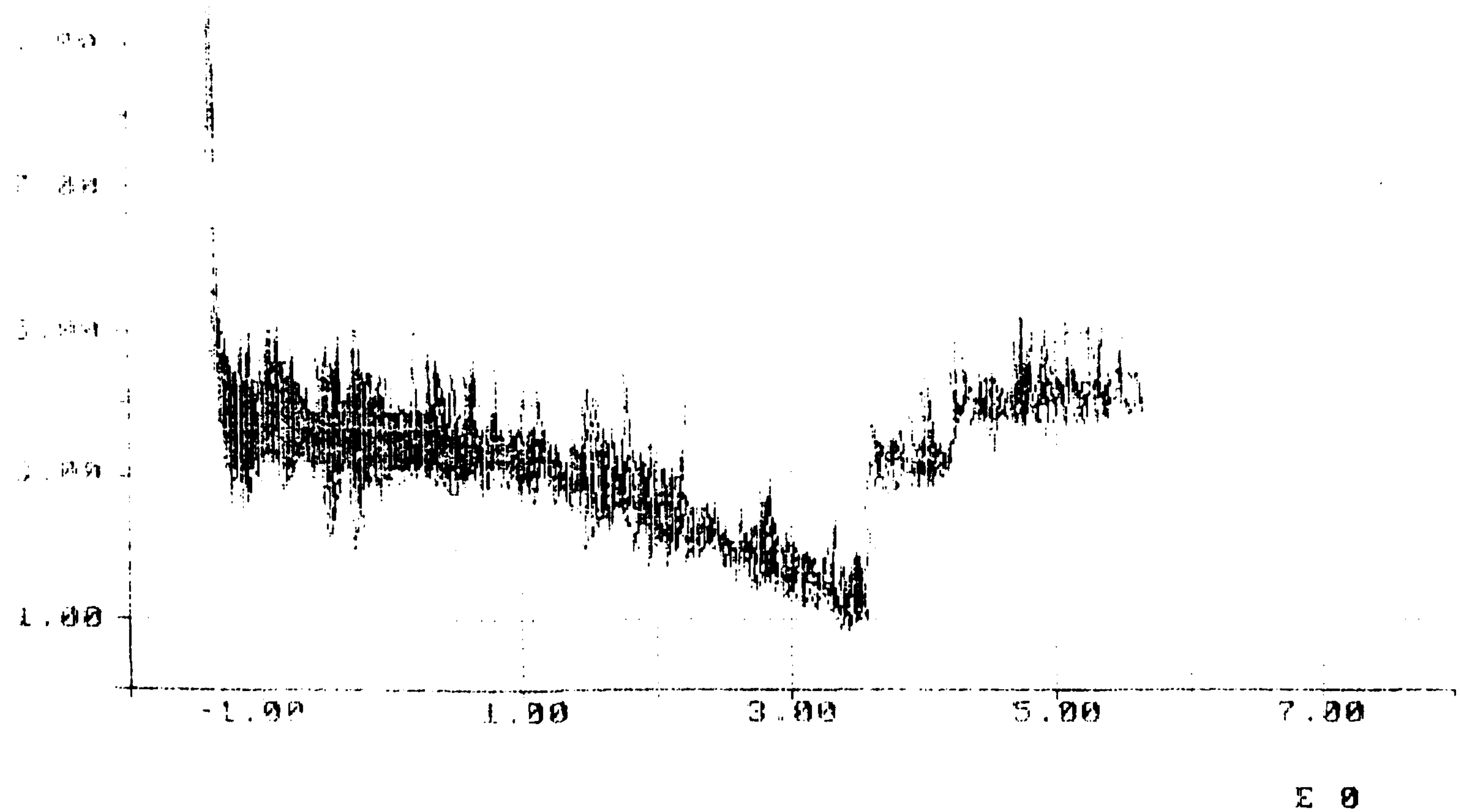

5.96
-1.00
.000
1.00
2.00
3.00
E 0

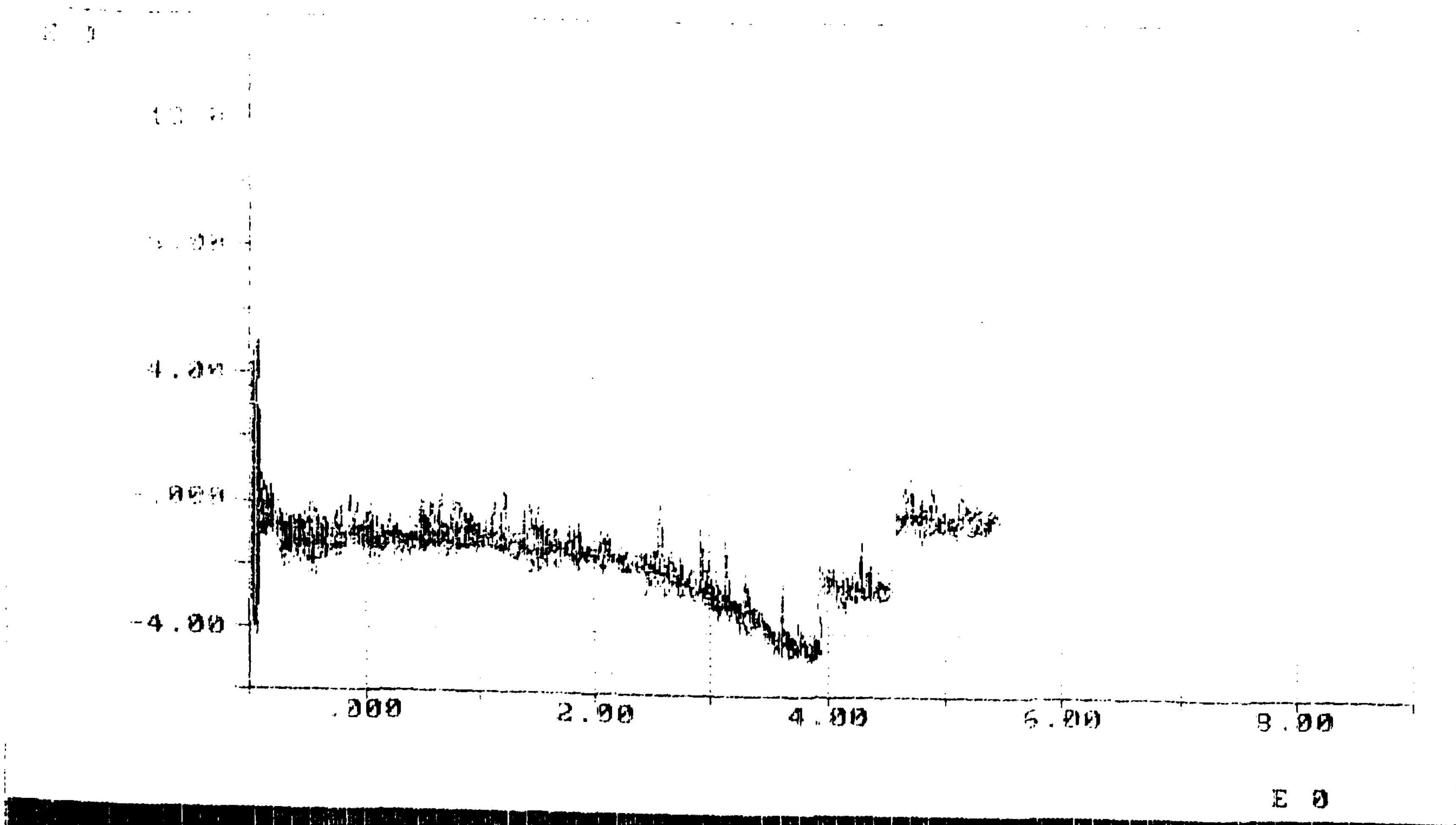


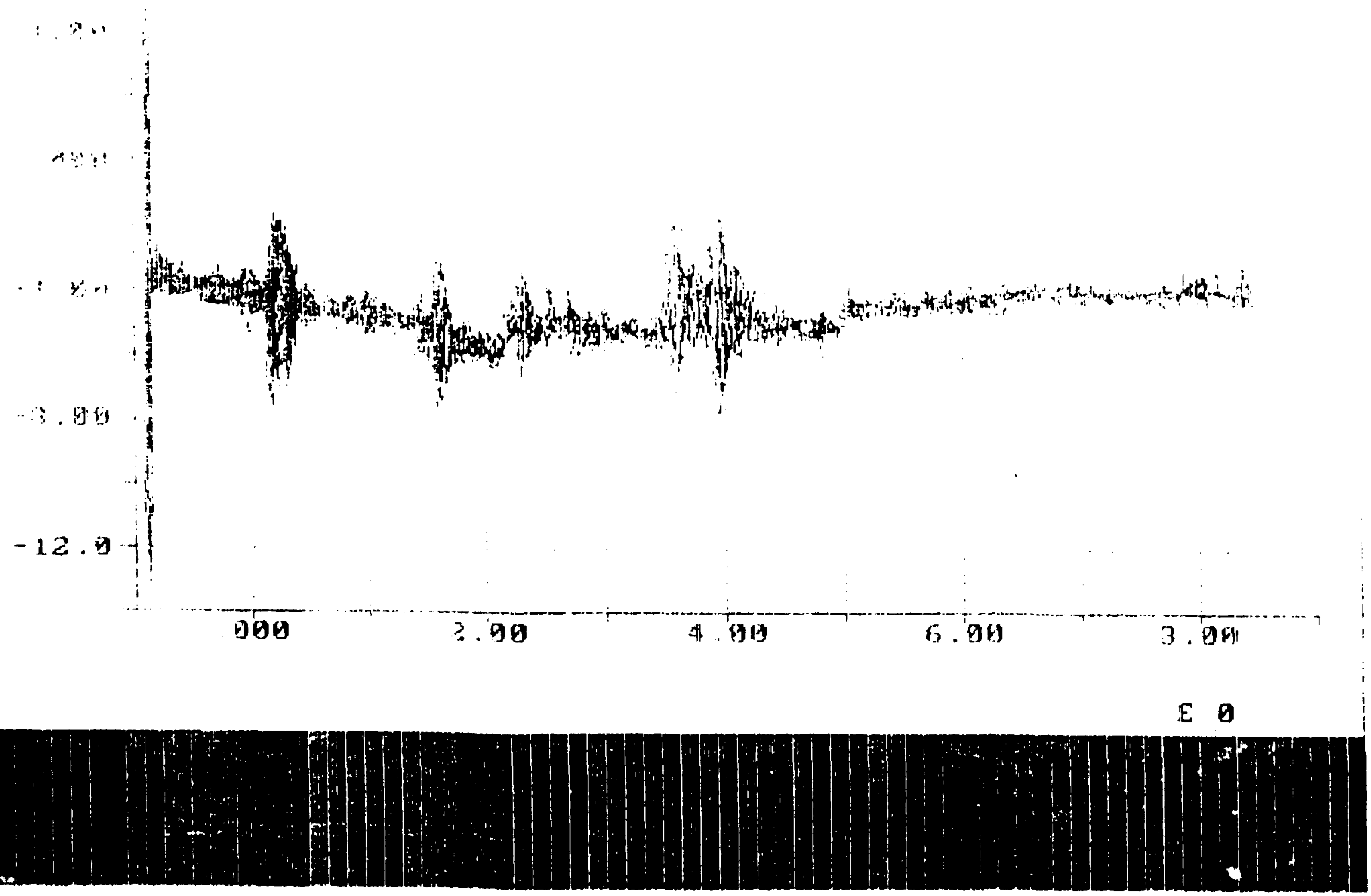
20.0
12.0
8.00
4.00
-1.00
1.00
3.00
5.00
7.00
E 0

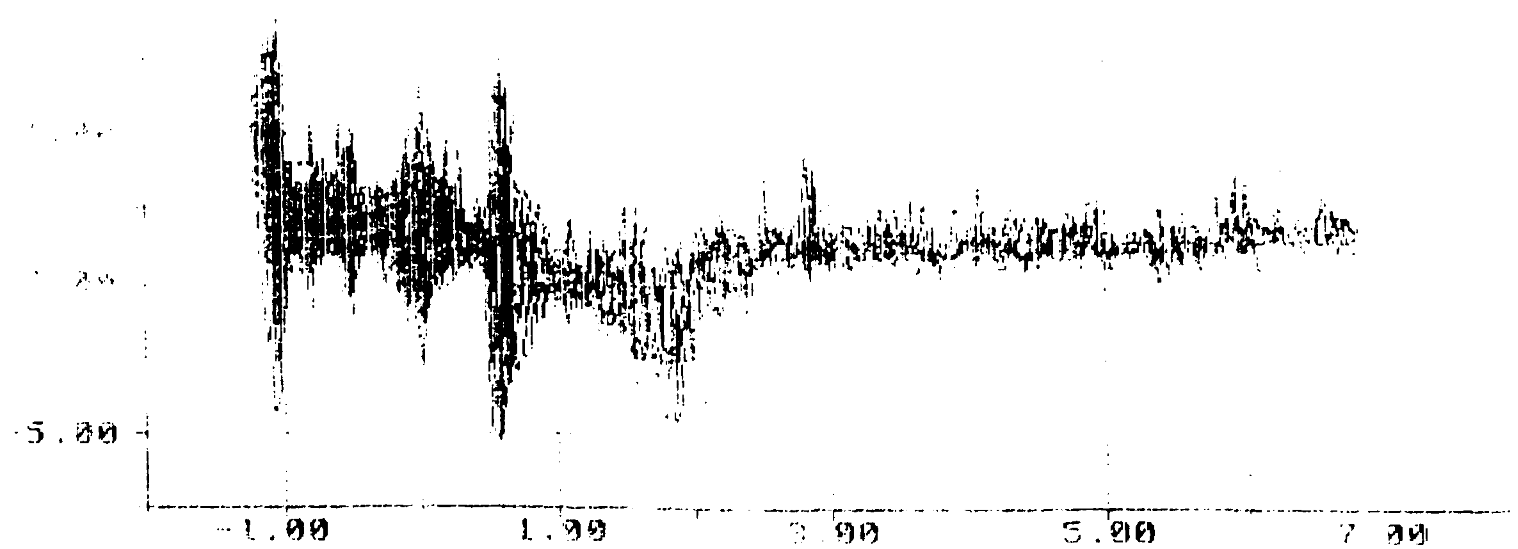

7.00
-1.00
1.00
3.00
5.00
7.00
E 0


2.00
10.0
8.00
10.0
12.0
14.0
E 0

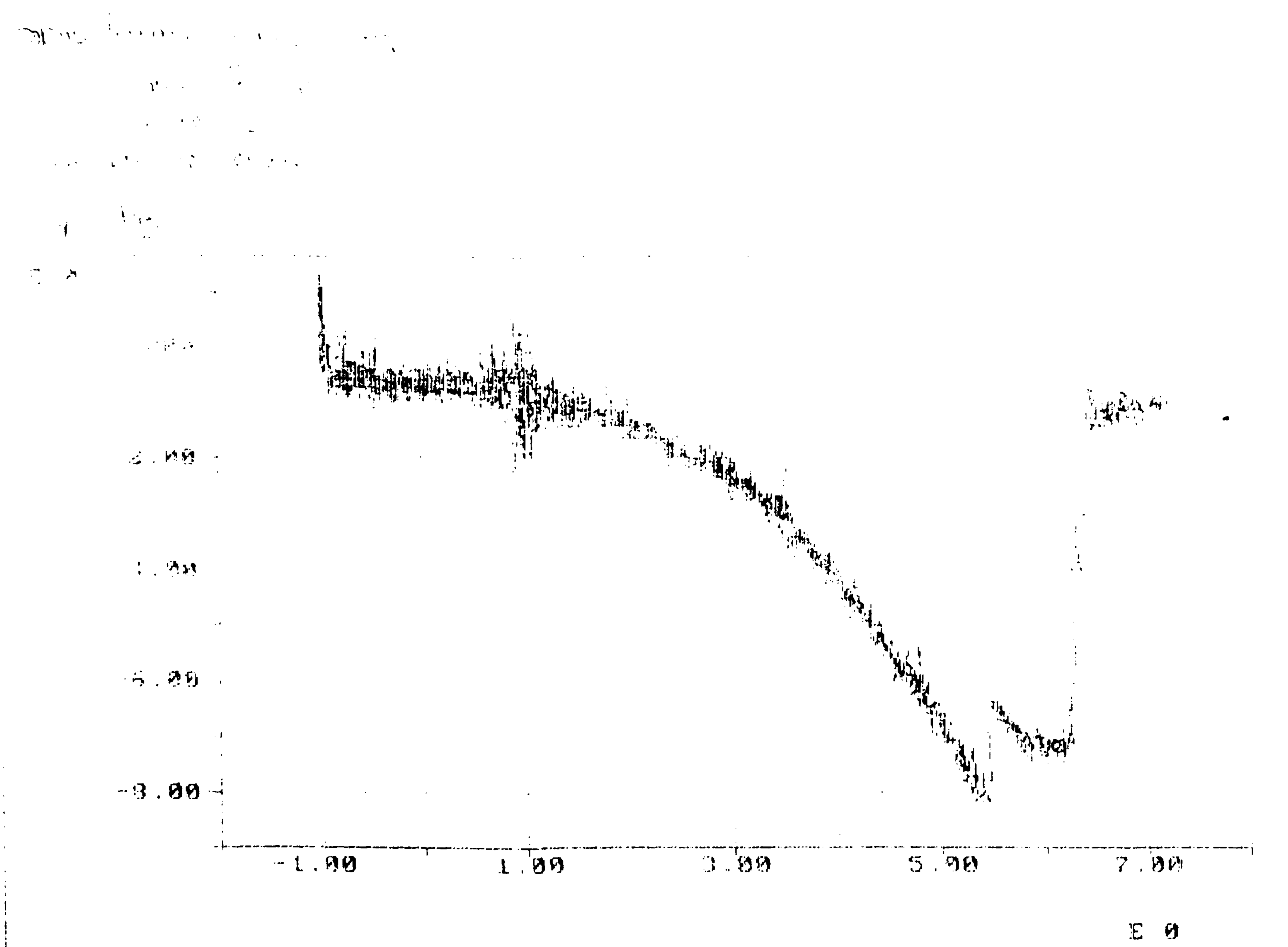

1.00
-1.00
1.00
3.00
5.00
7.00
E 0

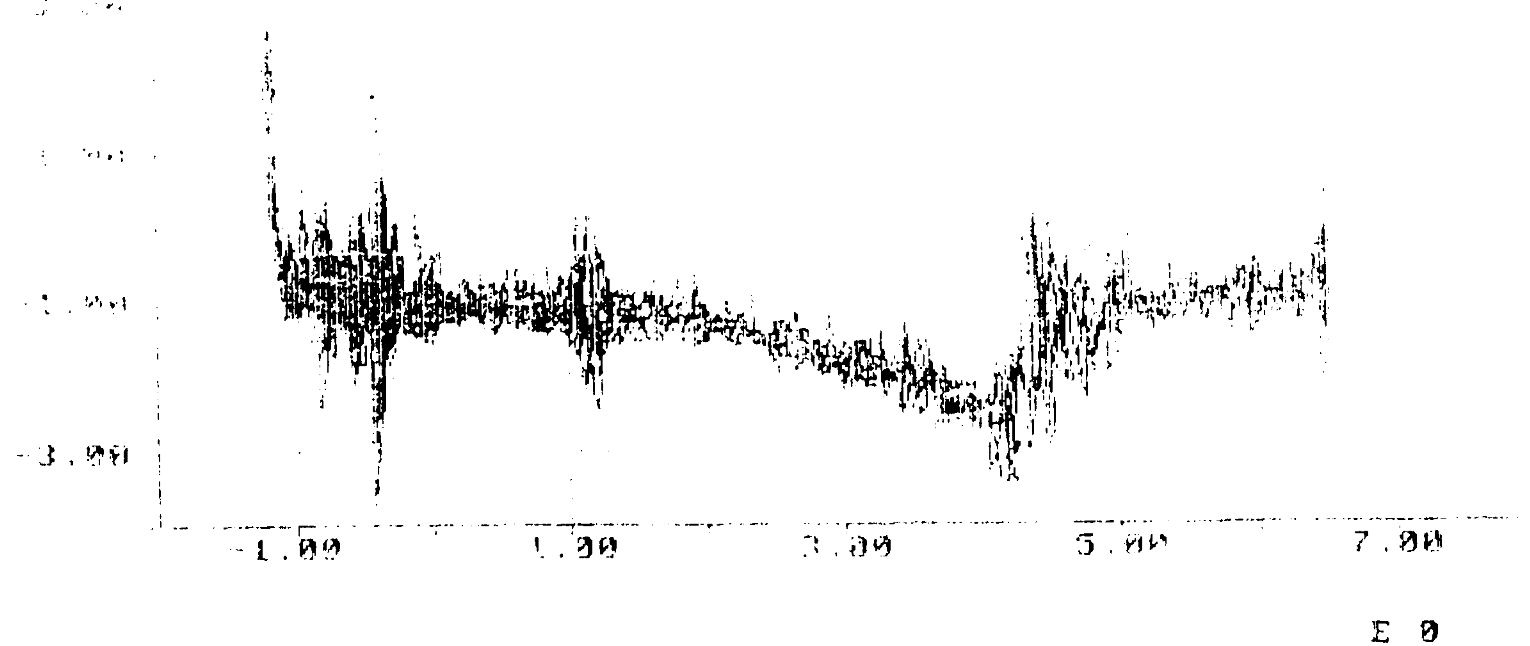

4.00
.000
-4.00
.000
2.00
4.00
6.00
8.00
E 0

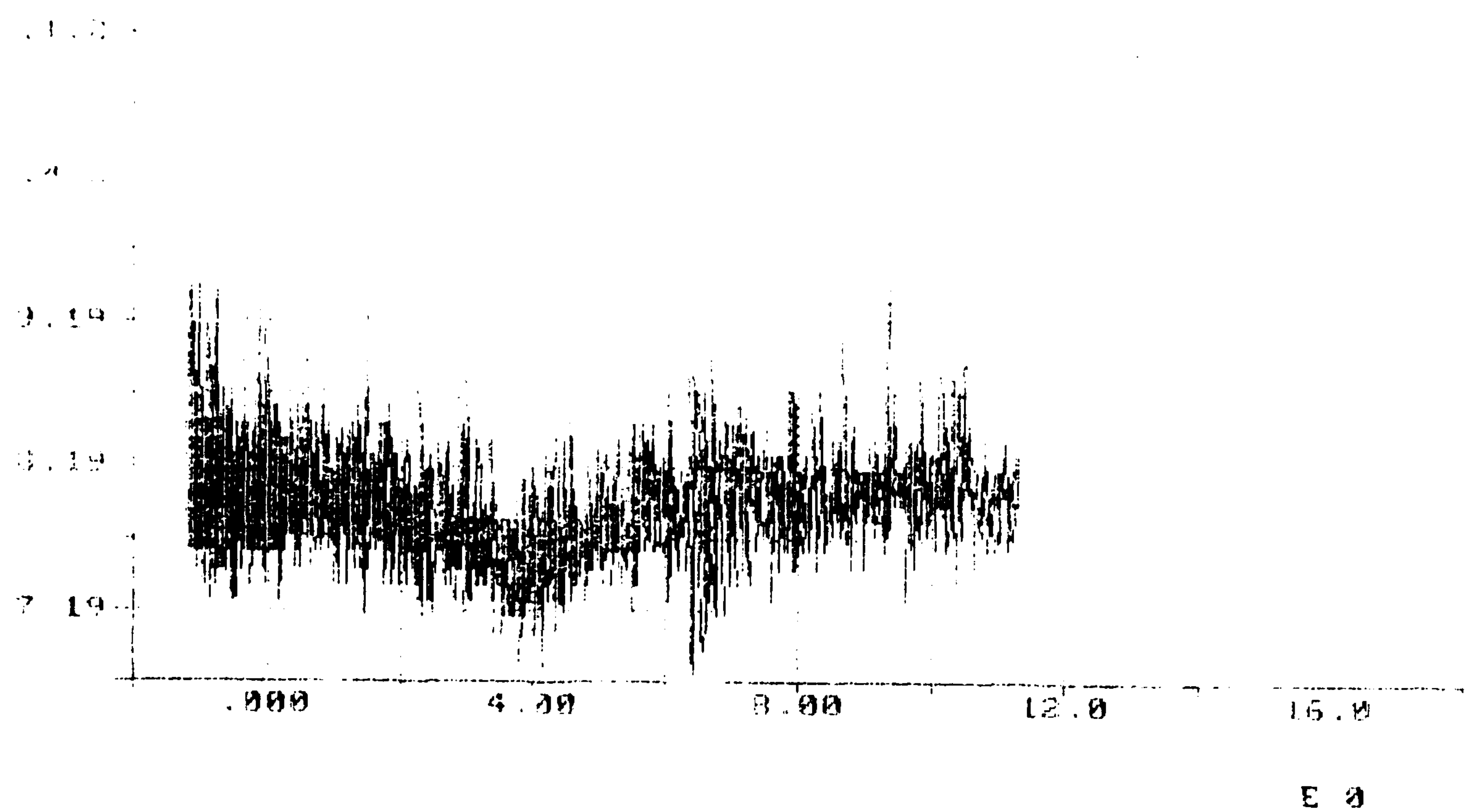

-12.0
000
2.00
4.00
6.00
3.00
E 0



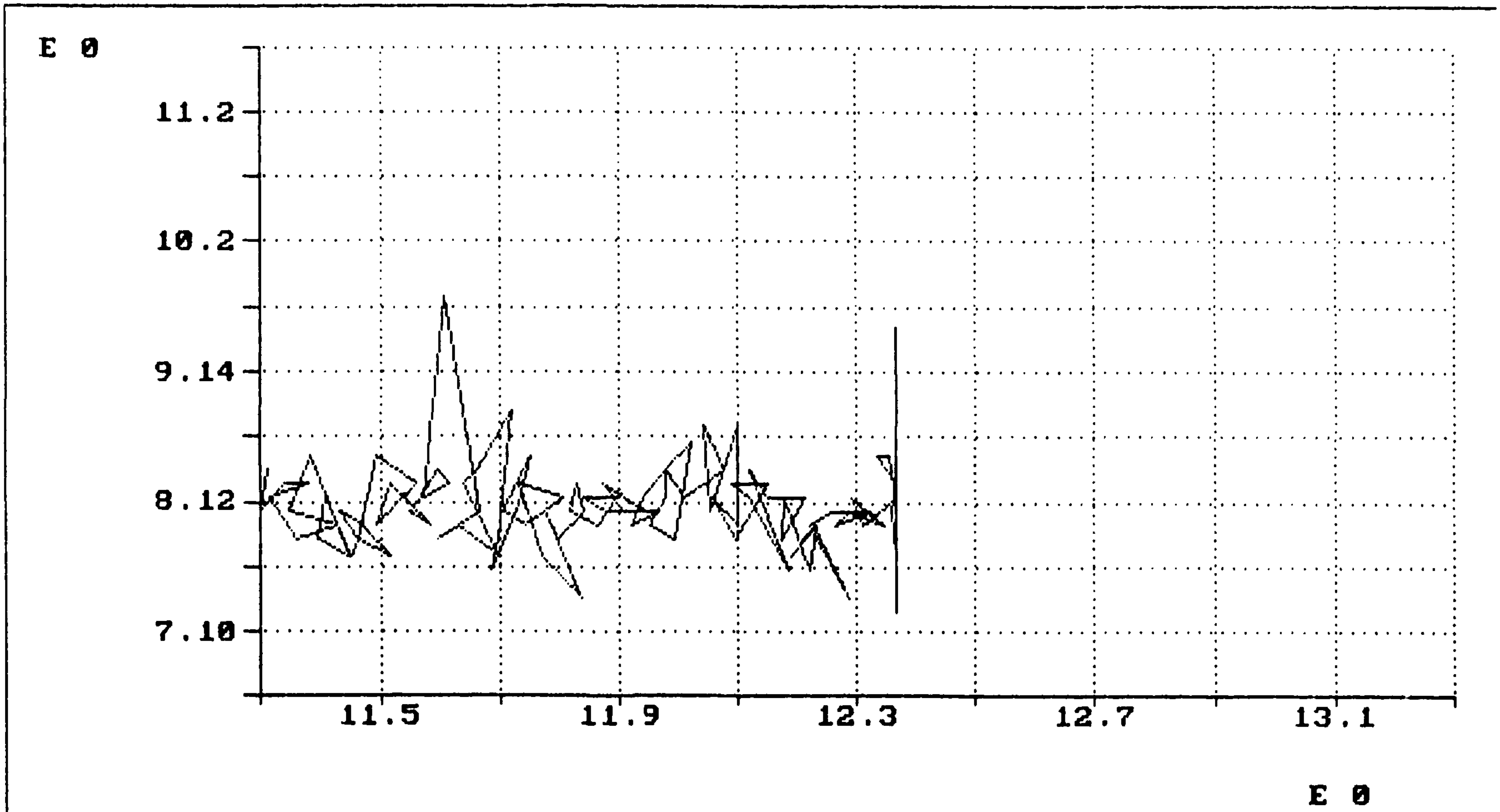
-5.00
-1.00
1.00
3.00
5.00
7.00
E 0


-3.00
-1.00
1.00
3.00
5.00
7.00
E 0

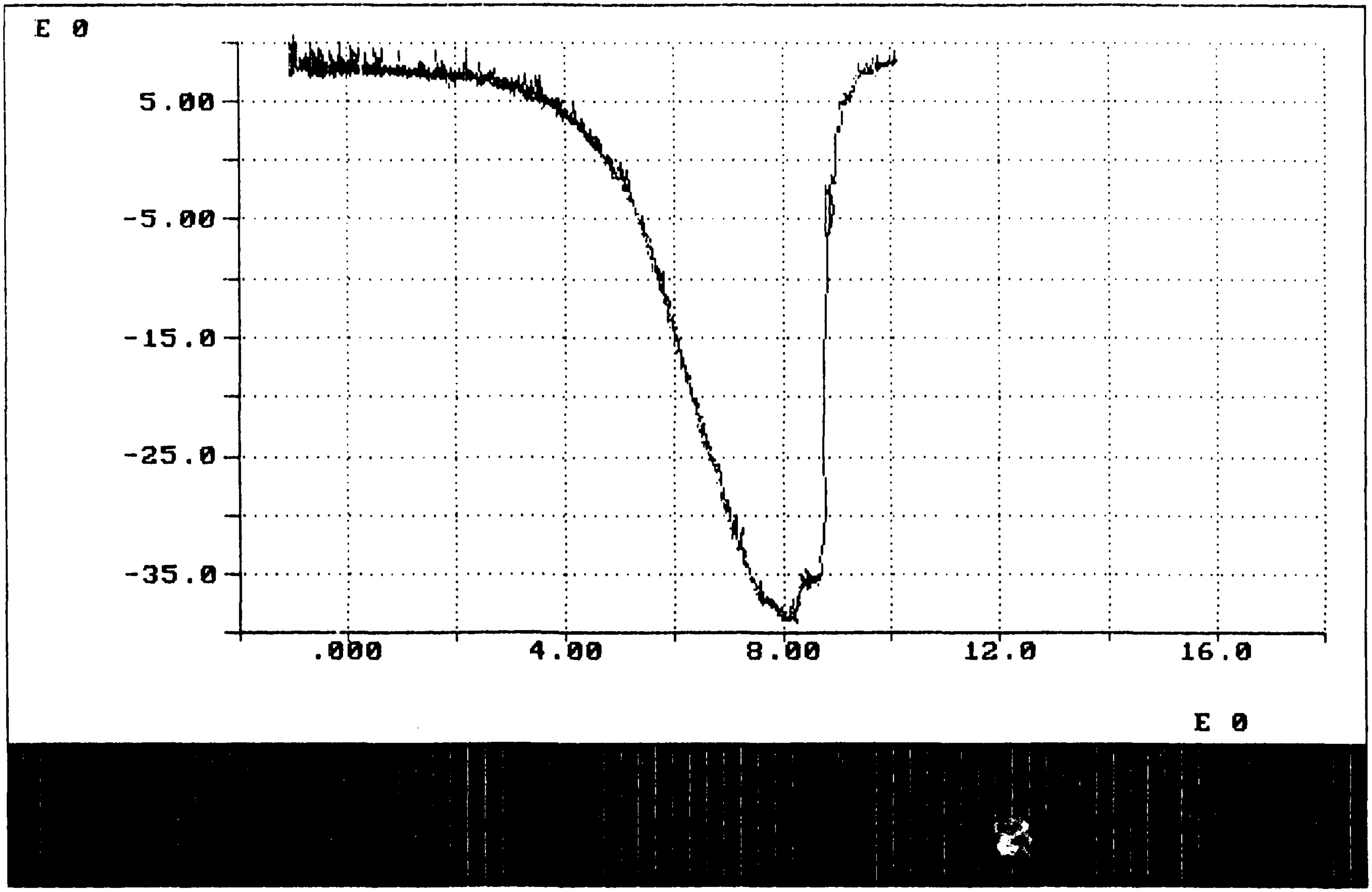

-3.00
-1.00
1.00
3.00
5.00
7.00
E 0


7 19
.000
4.00
8.00
12.0
16.0
E 0

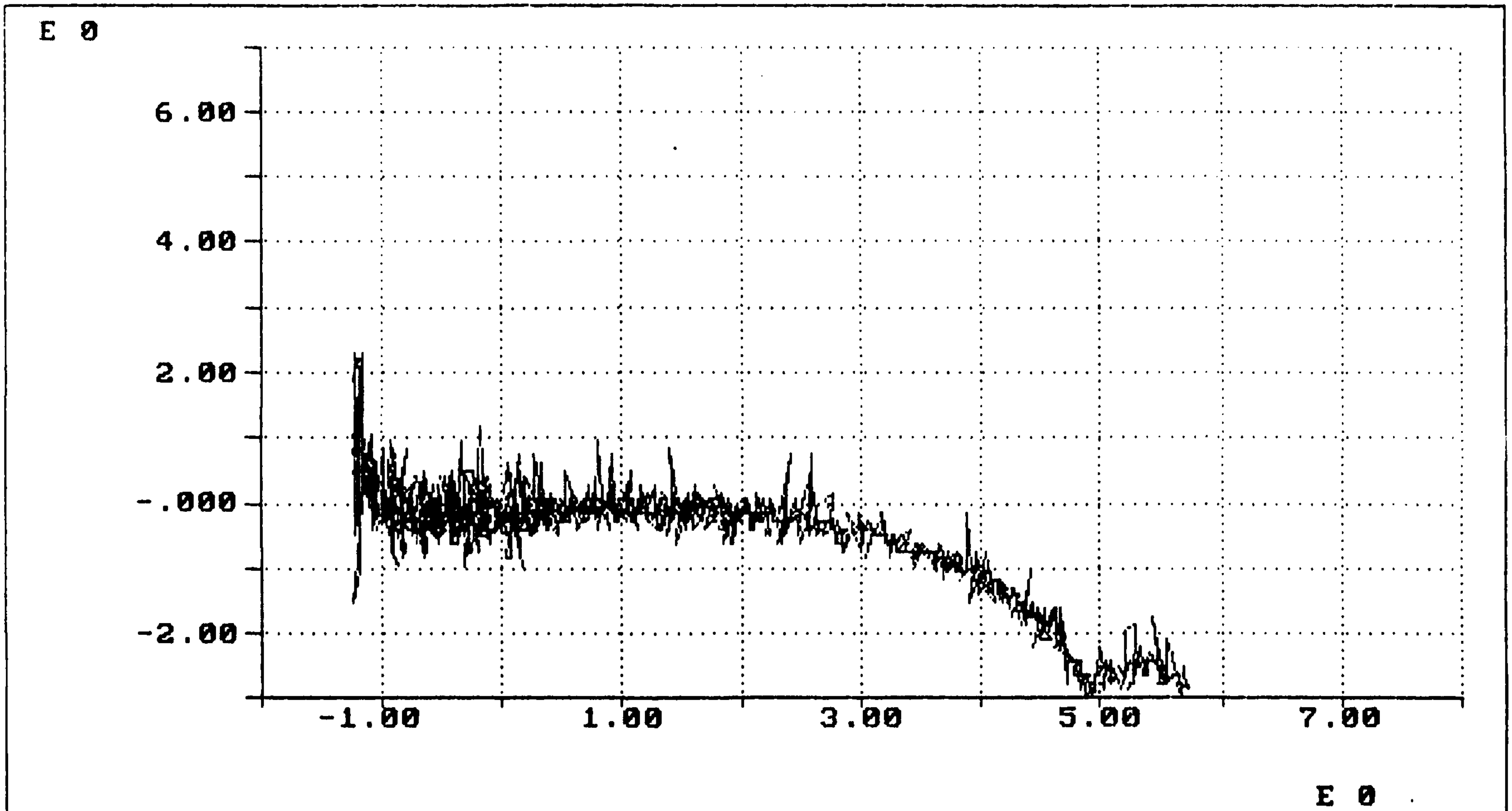
SEP 5M
(2500 → end)

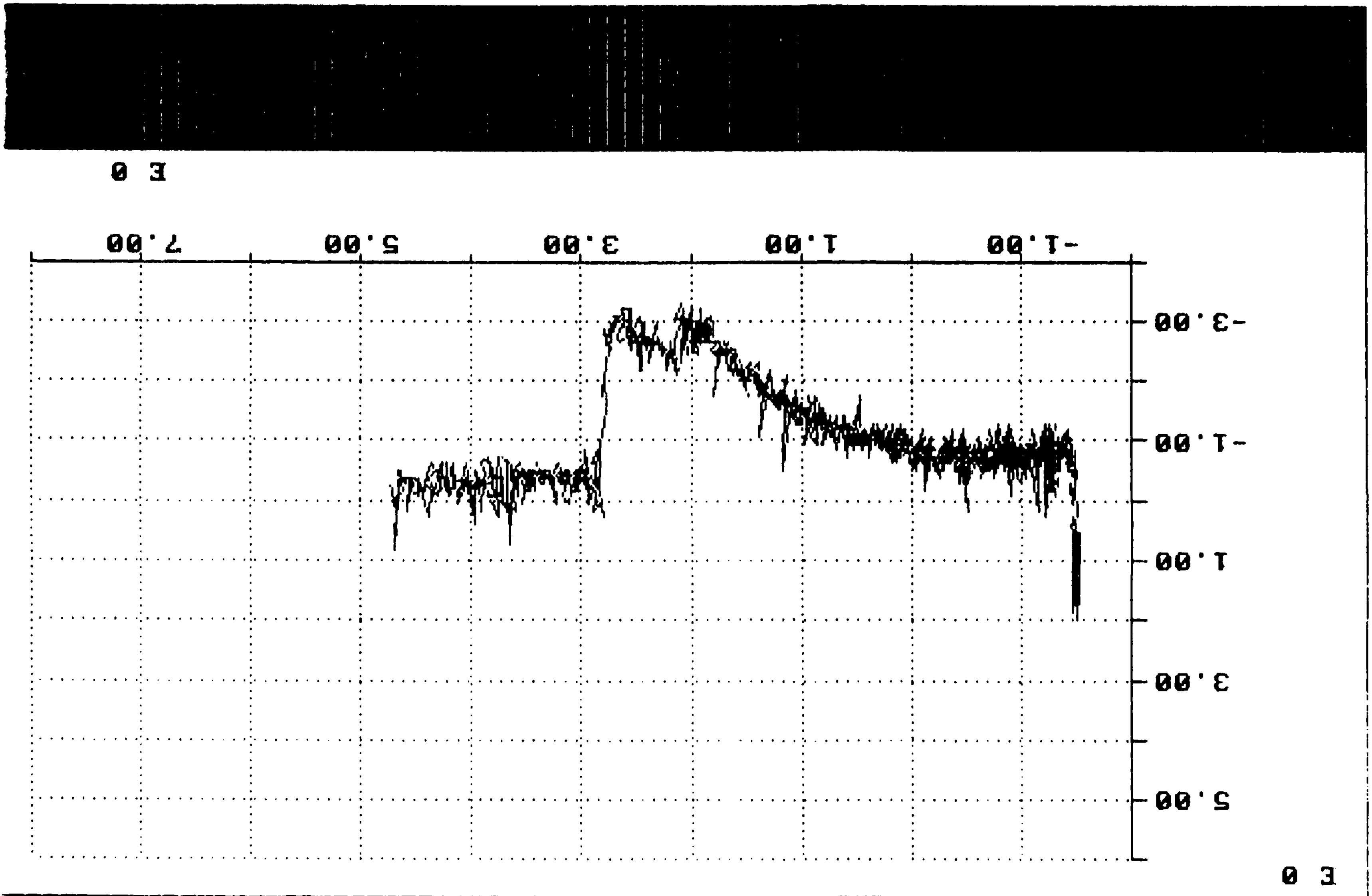


Sep 5 N
one strip unwelded
wld saline control
slimy



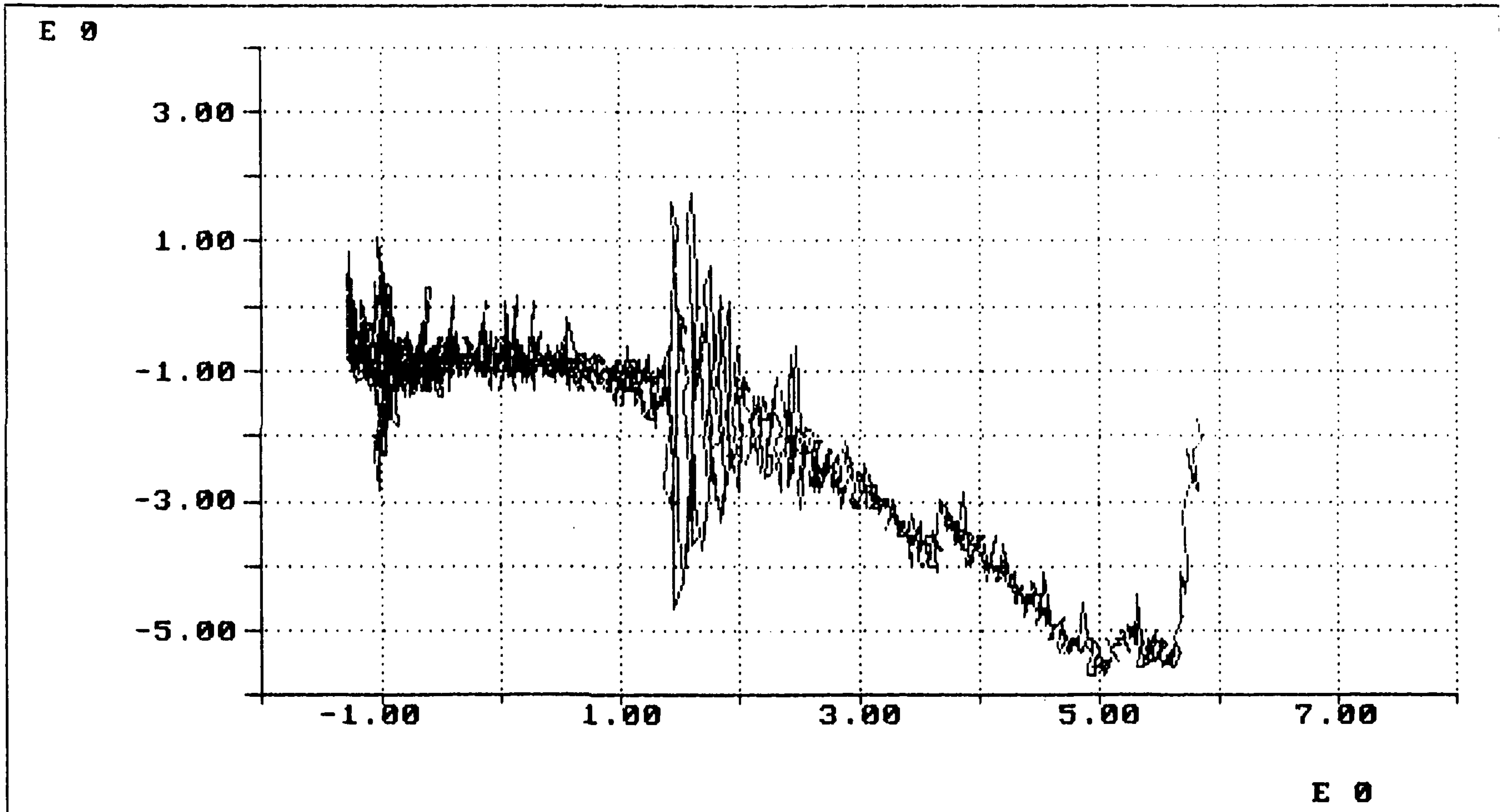
SEP 50
India Juice controlled at 50
Uncalibrated
Slurry





SEP 5P
India Ink set-60
Tc max = 55
Some blanching, dessication
Slump

JEP5 ①
India Ink controlled at 70°
blanching, dessication
moderate smoke
weak weld

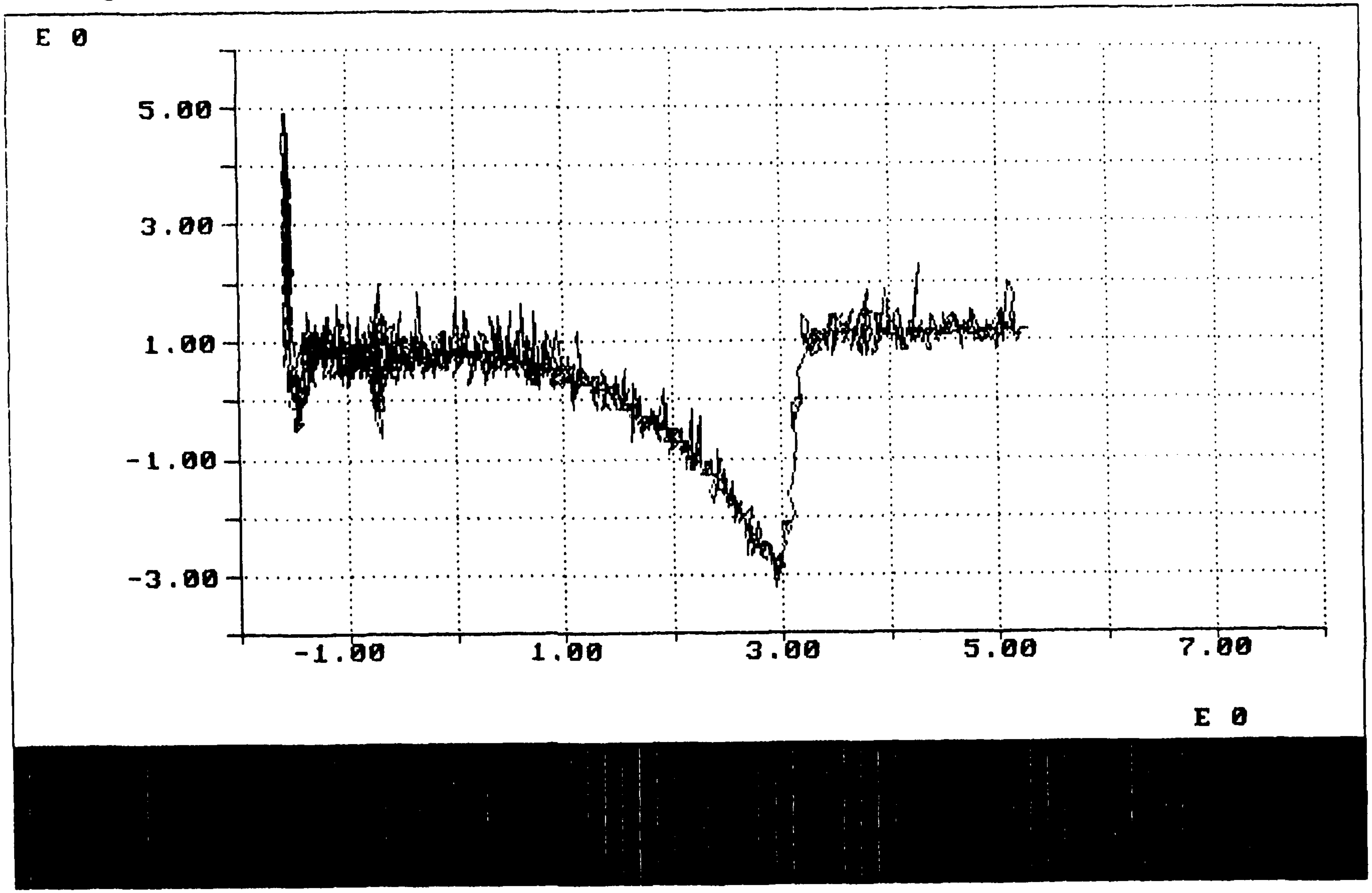


SEP 5R

Endur Inl set = 80°

Tc max = 60

No visible change

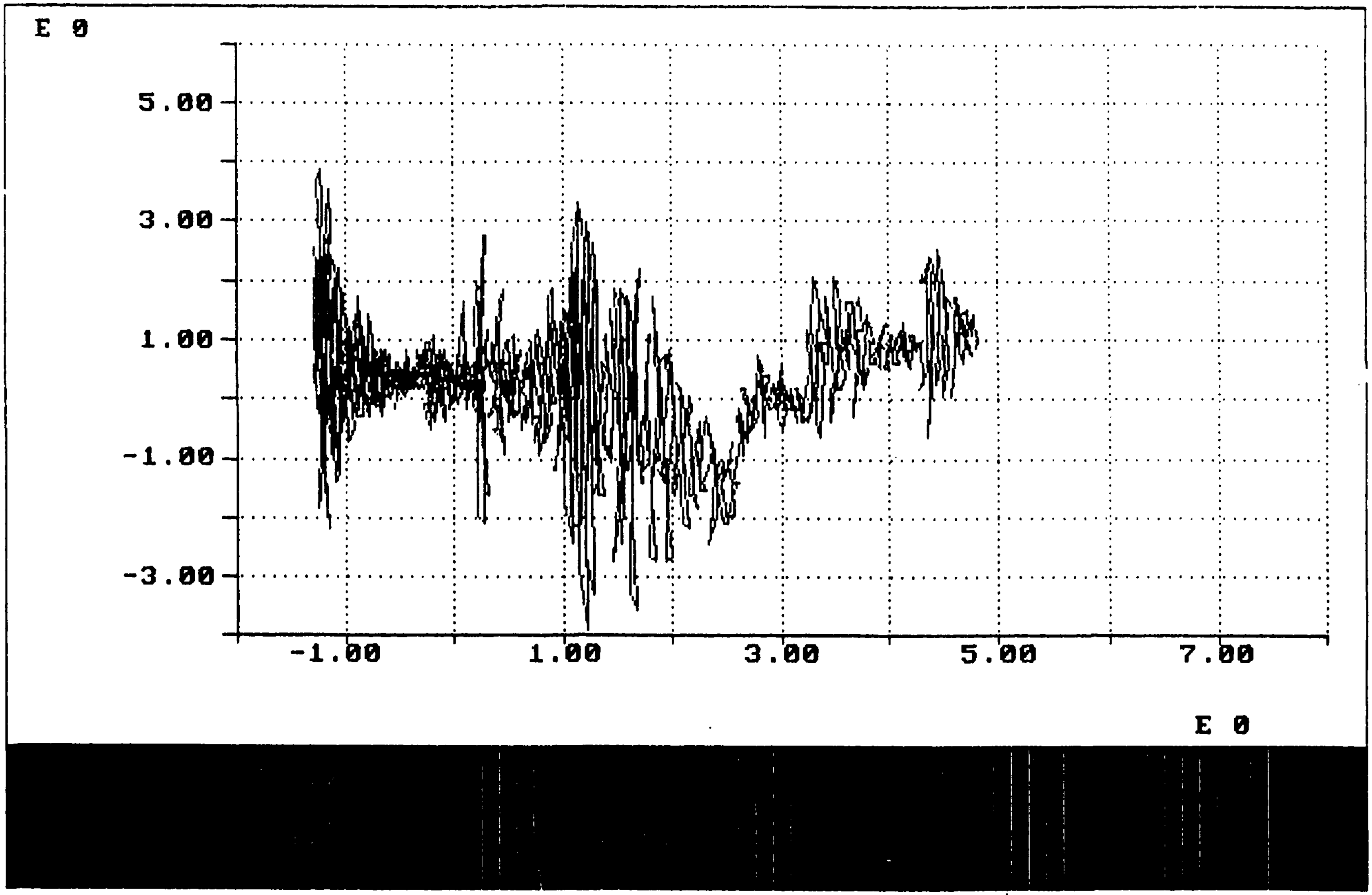


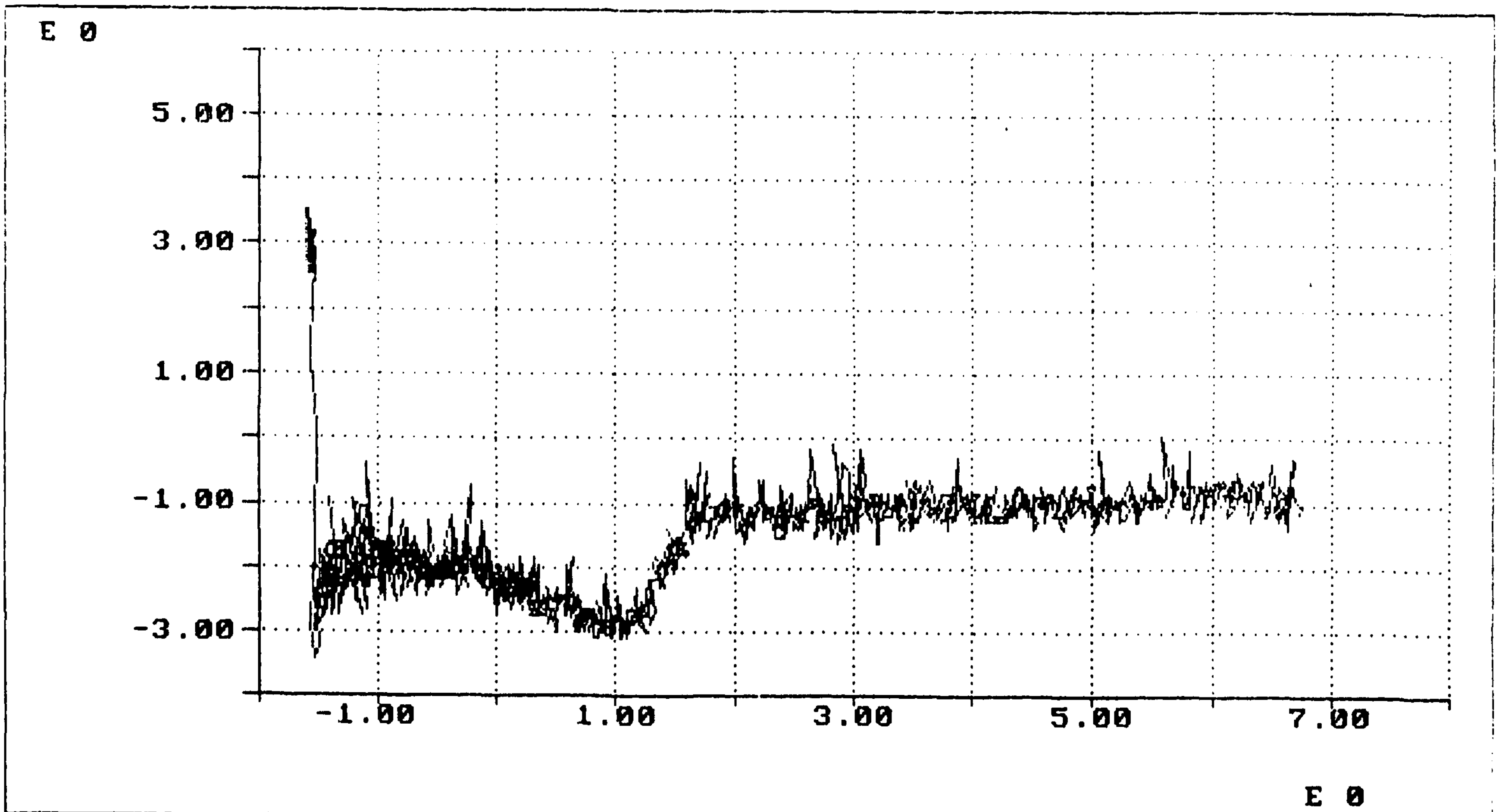
JEP 55

India ink controlled at 80°

No visible changes

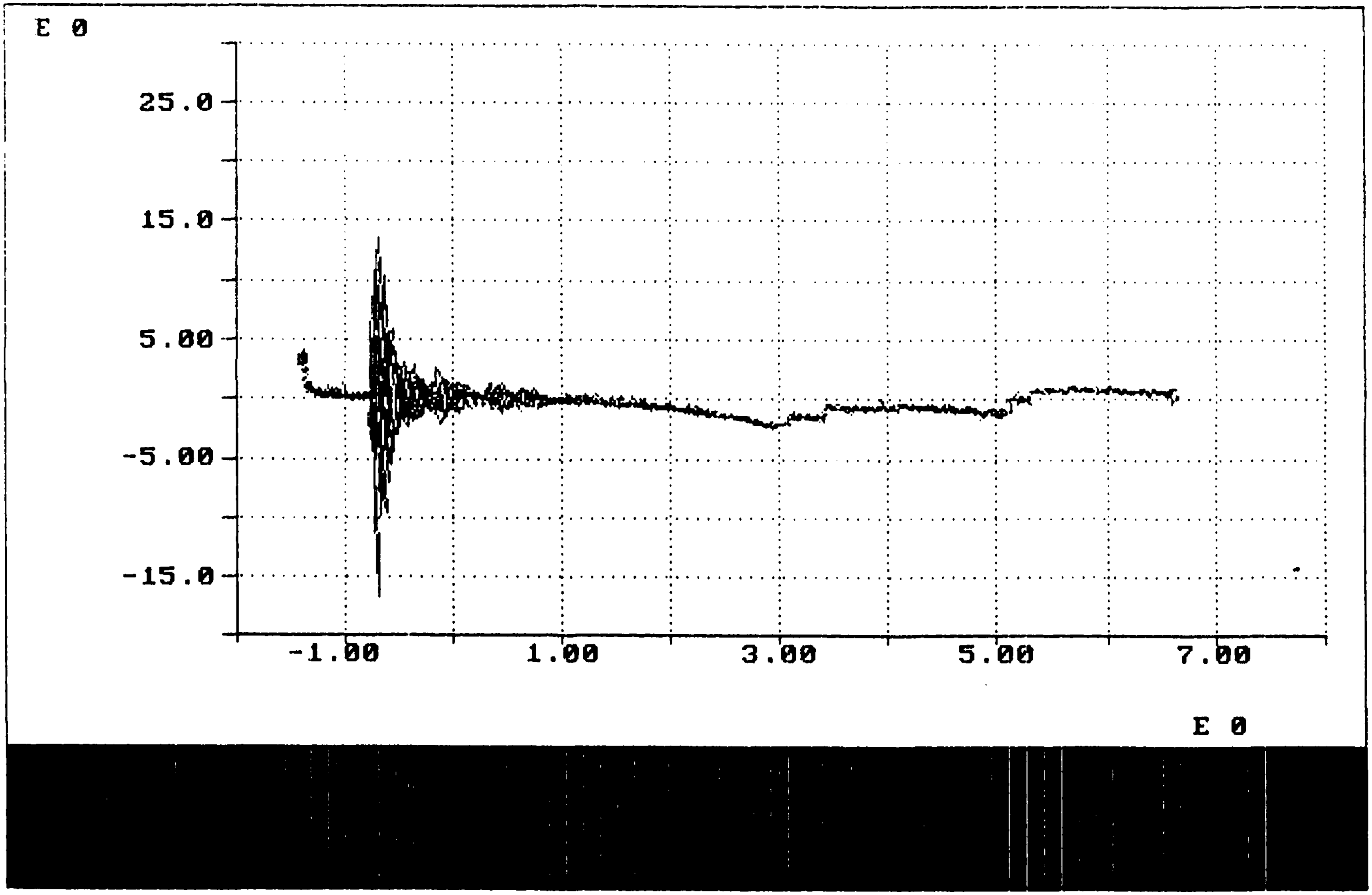
Very weak weld



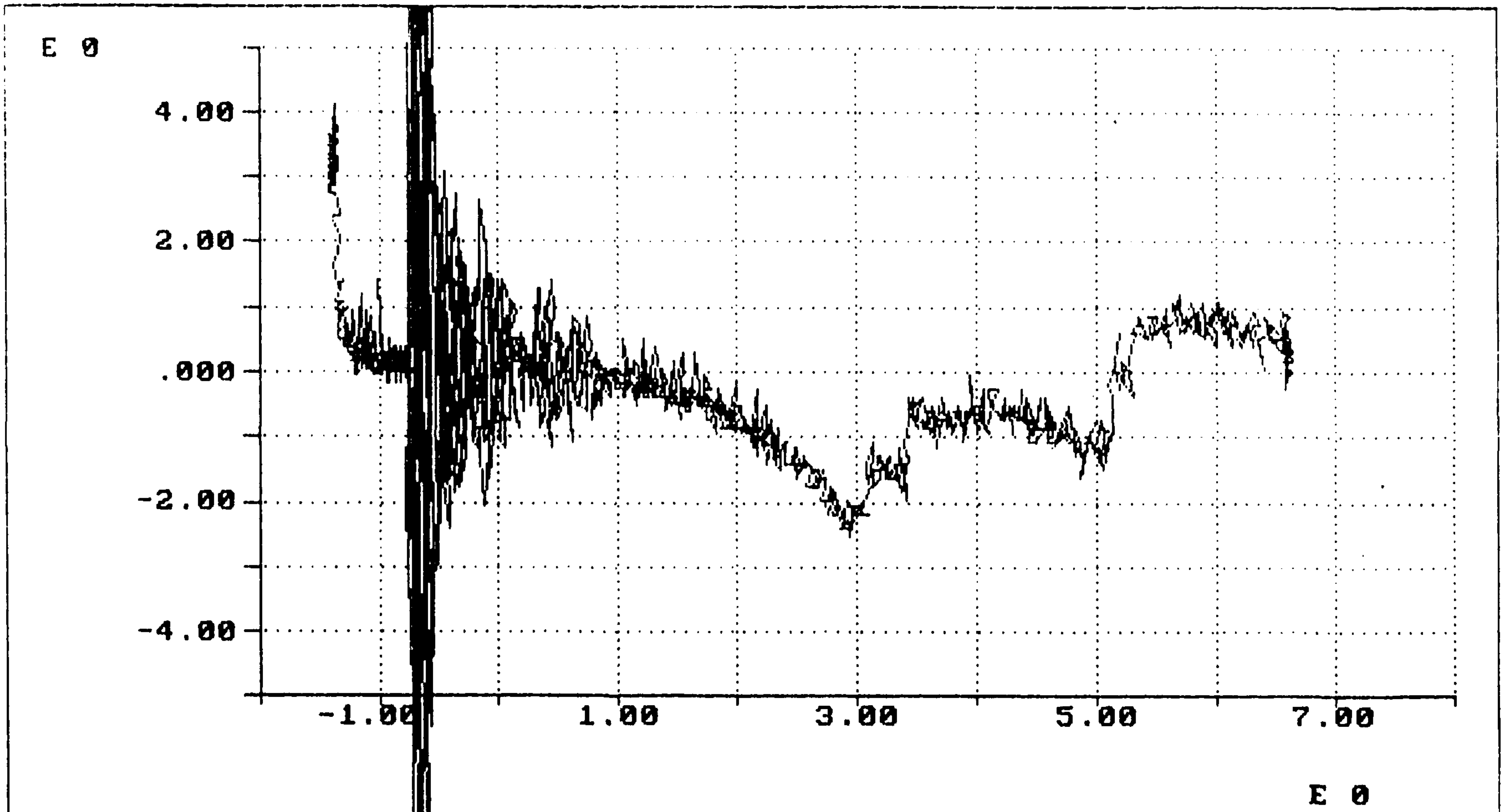


SEPST
Aradia Shell set = 100°
Tc max = 55°
blanching, dessication, smoke
weak weld
tissue didn't look welded

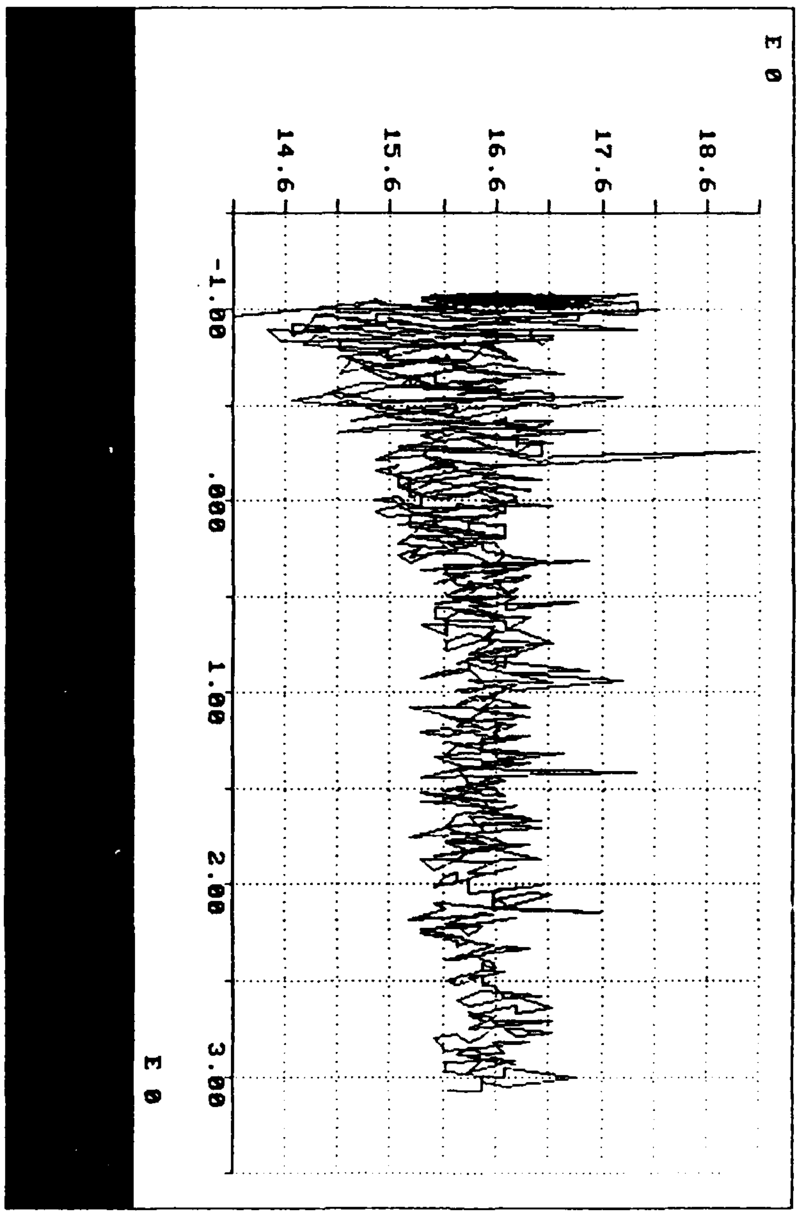
SEP 54
Indica Ink
Controlled at 100%
Desiccation and blanks
weak in ed



SEP54
(replotted)

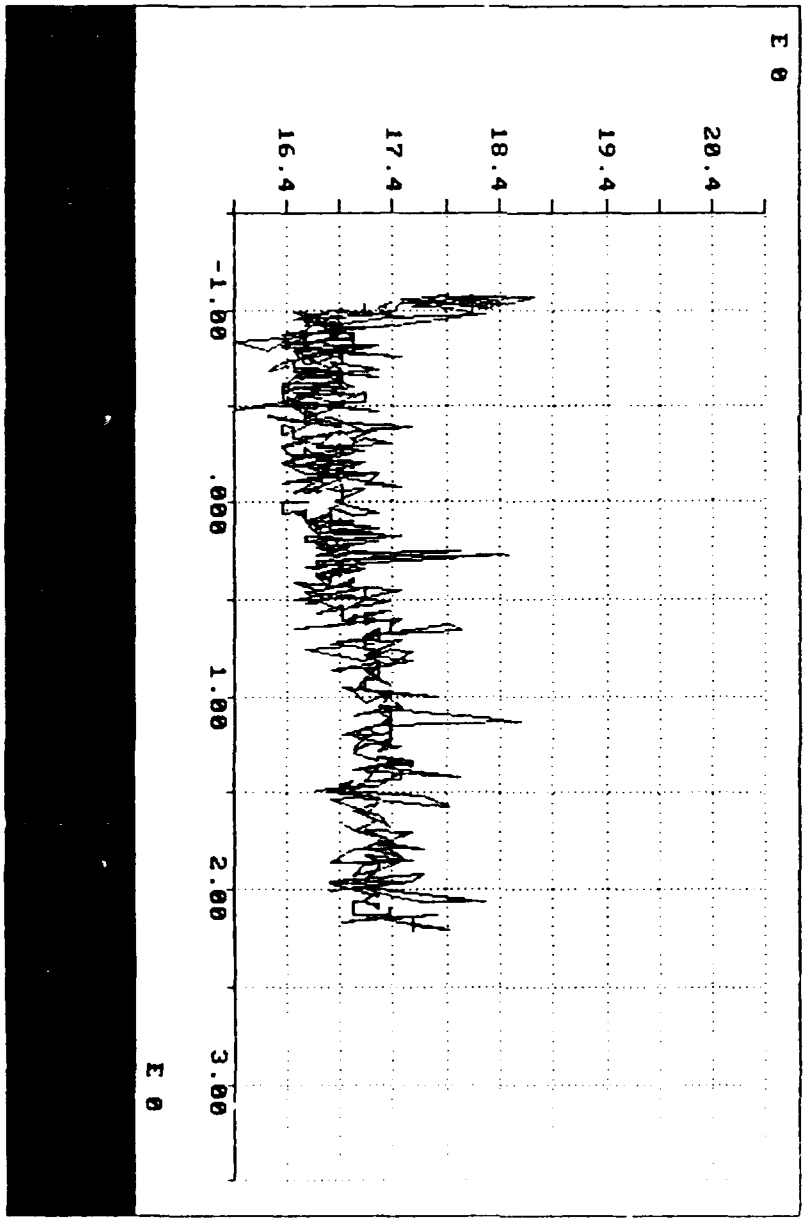


```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:
:                                                                                   :
:    File Name: <C:SEP7U.USR>                      Quit/Continue: *           :
:                                                                                   :
:    8 Comments                                    Subfiles  (Total #: 3 )      :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
: 1> INDIA INK                              : Start#      Shape      #Repts :
: 2> CONTROLLED AT 60                       :    1        2 x 256            :
: 3> SLIGHT DESSICATION                     :                                :
: 4> NOT VERY IMPRESSIVE                    :                                :
: 5>                                        :                                :
: 6>                                        :                                :
: 7>                                        :                                :
: 8>                                        :                                :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
:  I/O Variable ( R - Z ):                      1024 REAL                  :
:                                                                                   :
:  Subfile:       < 1 >          2 x 256 (Max Length:  768 )               :
:  Row (0=all):   < 0 >                                                     :
:  Start Column: < 1 >                                                      :
:  # of Columns: < 256 >                                                    :
:                                                                                   :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                 :
:                                                                                   :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```



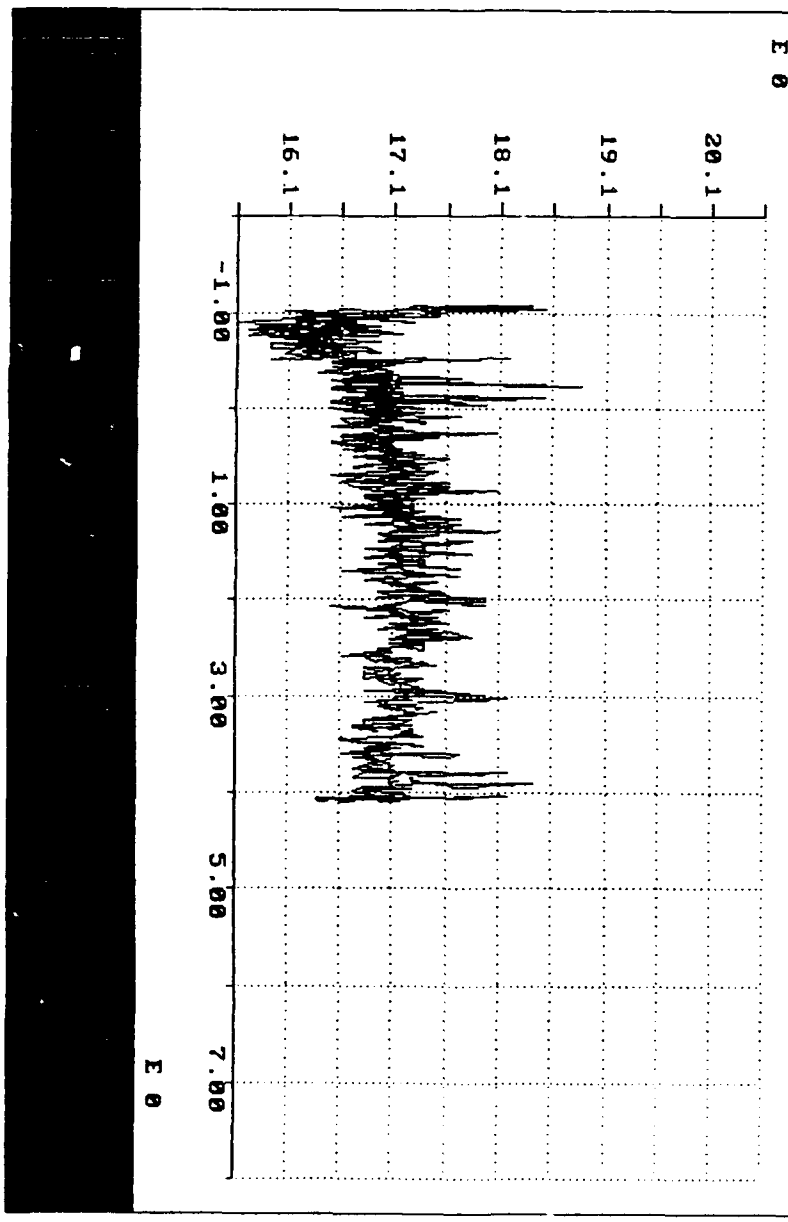
SEP7U

```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:                                                                                      :
:    File Name: <C:SEP7V.USR>                     Quit/Continue: *                     :
:                                                                                      :
:    8 Comments                                     Subfiles  (Total #: 2 )           :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMY
: 1> INDIA INK CONTROLLED AT 70               : Start#      Shape         #Repts :
: 2> LITTLE VISUAL CHANGE                      :    1        2 x 256         2    :
: 3> SOME SMOKE                                :                                   :
: 4> NOT VERY STRONG                           :                                   :
: 5>                                           :                                   :
: 6>                                           :                                   :
: 7>                                           :                                   :
: 8>                                           :                                   :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMY
:  I/O Variable ( R - Z ):                             768 REAL                       :
:                                                                                      :
:  Subfile:       < 1 >            2 x 256 (Max Length: 512 )                          :
:  Row (0=all):   < 0 >                                                                :
:  Start Column: < 1 >                                                                 :
:  # of Columns: < 256 >                                                               :
:                                                                                      :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                            :
:                                                                                      :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```



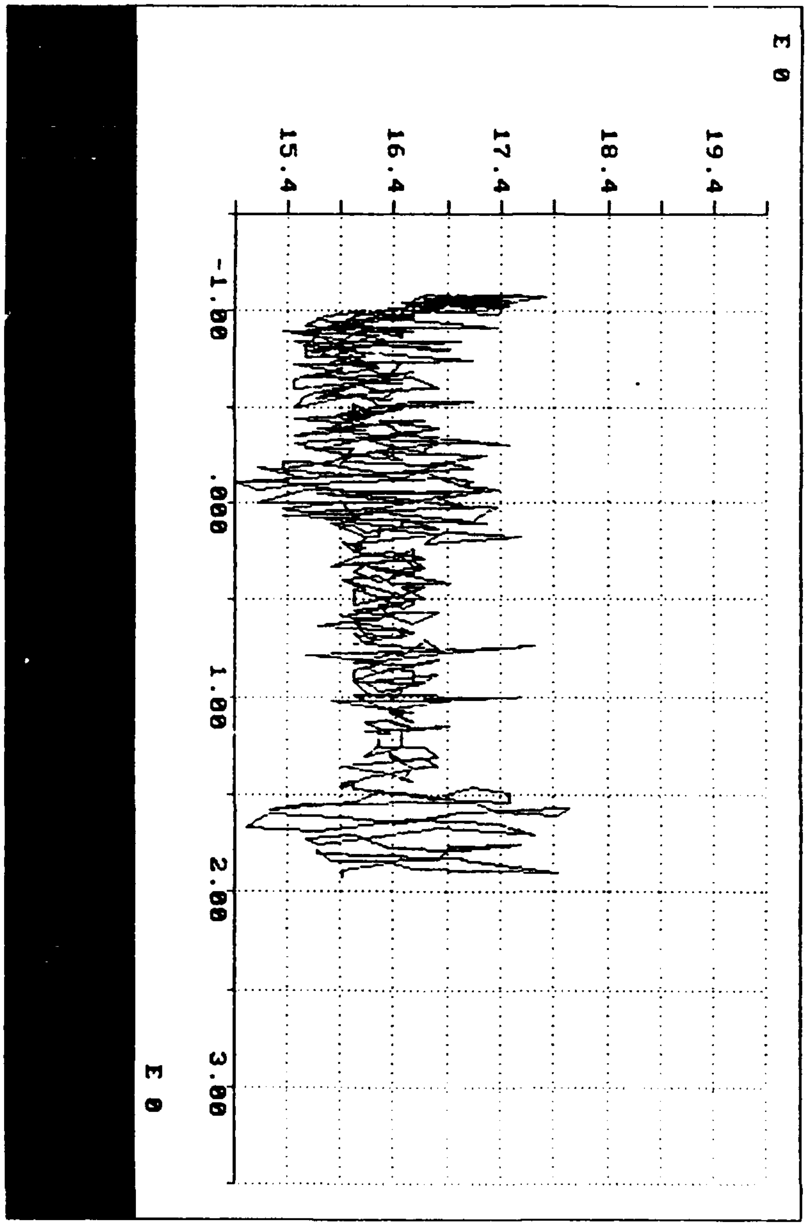
SEP 7V

```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:
:                                                                                  :
:    File Name:  C:SEP7W.USR                        Quit/Continue: *            :
:                                                                                  :
:    8 Comments                                     Subfiles  (Total #: 3 )       :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
: 1> INDIA INK CONTROLLED AT 80               : Start#      Shape       #Repts :
: 2> SLIGHT DESSICATION                       :    1        2 x 256        -     :
: 3> DID NOT LOOK VERY STRONG WHEN TEARING OFA:                                  :
: 4                                           :                                  :
: 5                                           :                                  :
: 6>                                          :                                  :
: 7>                                          :                                  :
: 8                                           :                                  :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
:  I/O Variable ( R - Z ):                         512 REAL                     :
:                                                                                  :
:  Subfile:        < 1 >          2 x 256 (Max Length:  768 )                    :
:  Row (0=all):    < 0 >                                                          :
:  Start Column:  < 1 >                                                           :
:  # of Columns:  < 256 >                                                         :
:                                                                                  :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                      :
:                                                                                  :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```



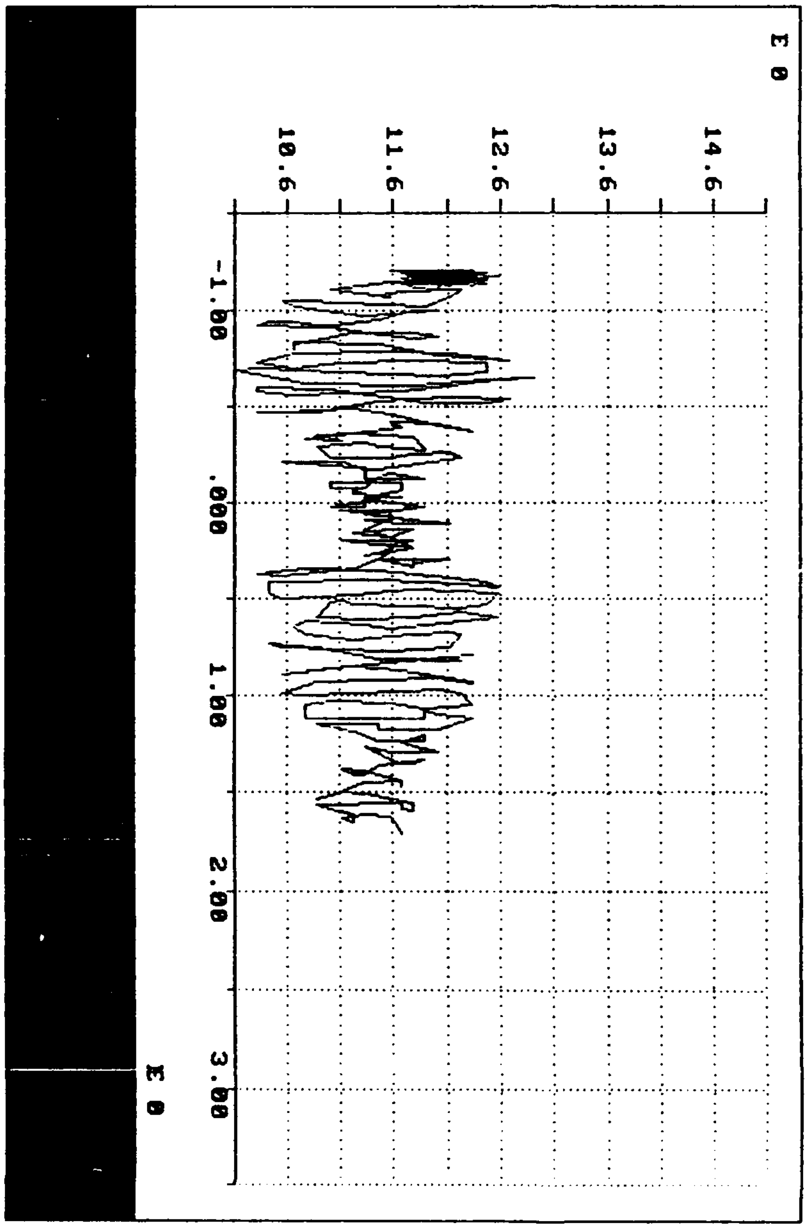
SEP 7W

```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:                                                                              :
:    File Name: 'C:SEP7X.USR'                         Quit/Continue: *         :
:                                                                              :
:    8 Comments                                         Subfiles  (Total #: 2 )  :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
: 1> INDIA INK LONGITUDINAL SECTION          : Start#      Shape       #Repts :
: 2> CONTROLLED AT 70                        :    1        2 x 256       2    :
: 3> NO VISUAL CHANGES                       :                                :
: 4> BROKE QUICKLY-DID NOT SEE A WELD        :                                :
: 5>                                         :                                :
: 6                                          :                                :
: 7                                          :                                :
: 8>                                         :                                :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
:  I/O Variable ( R - Z ):                        768 REAL              :
:                                                                              :
:  Subfile:      < 1 >          2 x 256 (Max Length:  512 )             :
:  Row (0=all):  < 0                                                     :
:  Start Column: < 1                                                     :
:  # of Columns: < 256                                                   :
:                                                                              :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *         :
:                                                                              :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```

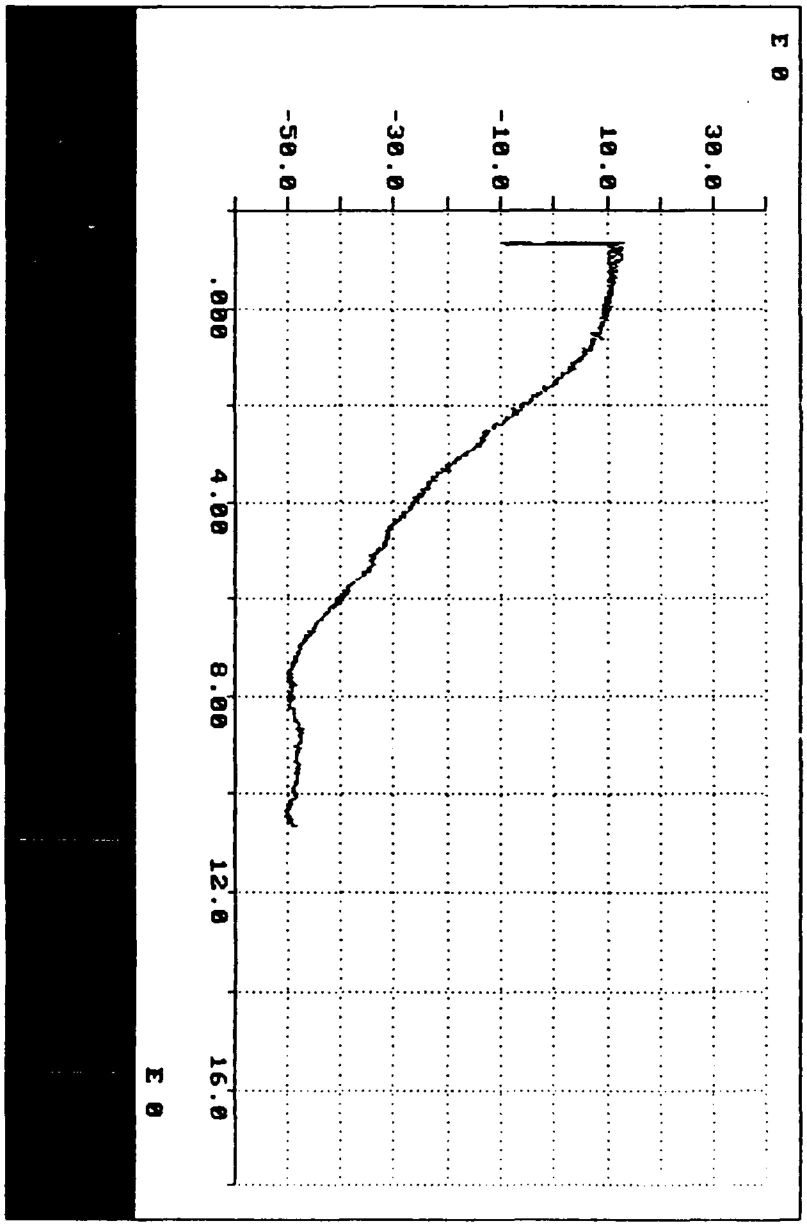


SEP7X

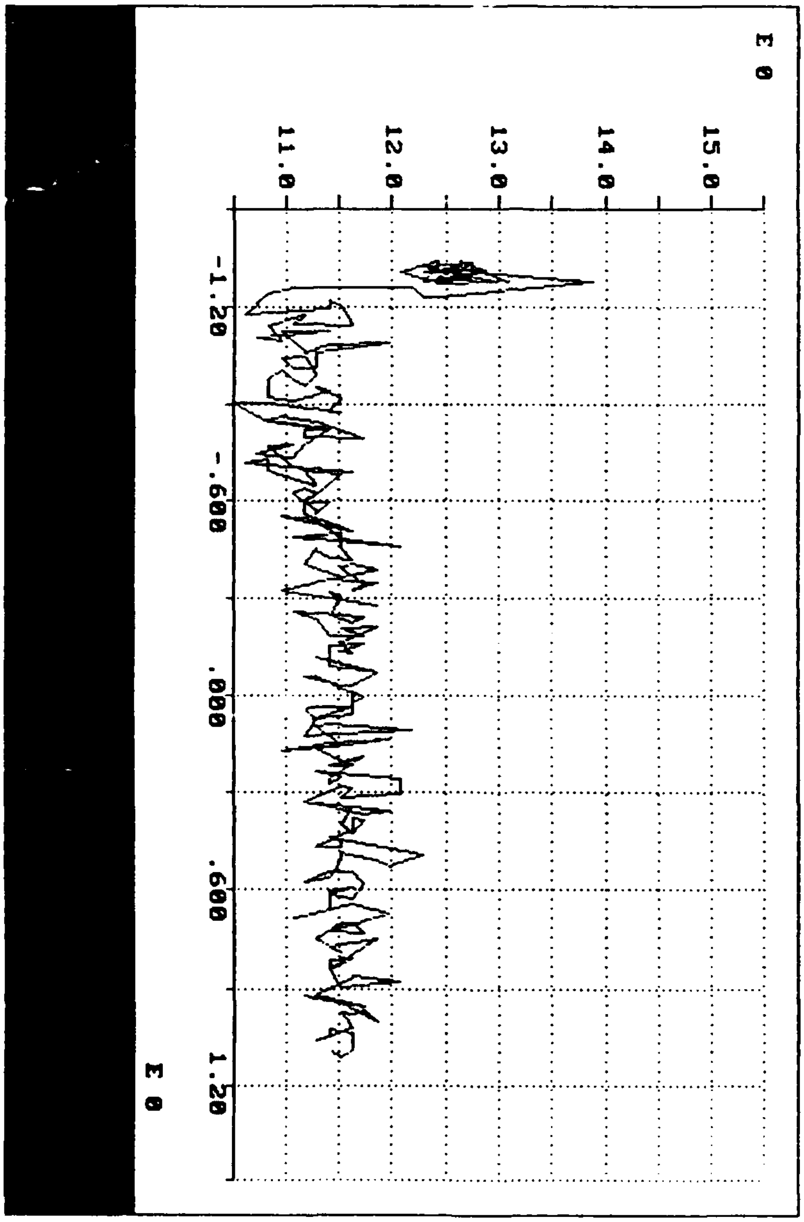
```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:
:                                                                              :
:    File Name: <B:SEF12A.USR                        Quit/Continue: *        :
:                                                                              :
:    8 Comments                                        Subfiles  (Total #: 2 )    :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
: 1> TWO STRIP CONTROL                           : Start#     Shape      #Repts :
: 2> SMALL APERTURE                              :    1       2 x 256      2    :
: 3>   SW                                        :                              :
: 4>                                             :                              :
: 5>                                             :                              :
: 6>                                             :                              :
: 7>                                             :                              :
: 8>                                             :                              :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
:  I/O Variable ( R - Z ): `                         1024 REAL          :
:                                                                              :
:  Subfile:       < 1 >          2 x 256 (Max Length:  512 )           :
:  Row (0=all):  < 0 >                                                      :
:  Start Column: < 1 >                                                      :
:  # of Columns: < 256                                                      :
:                                                                              :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *              :
:                                                                              :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:
:                                                                              :
:    File Name: <B:SEP12B.USR>                    Quit/Continue: *          :
:                                                                              :
:    8 Comments                                    Subfiles  (Total #: 4 )    :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
: 1> ONE STRIP CONTROL                          : Start#       Shape        #Repts :
: 2> NO SLIPPAGE                                :    1         2 x 256        4    :
: 3> Small Aperture                             :                                  :
: 4>   SW                                       :                                  :
: 5>                                            :                                  :
: 6>                                            :                                  :
: 7>                                            :                                  :
: 8>                                            :                                  :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
:  I/O Variable ( R - Z ):                           512 REAL                  :
:                                                                              :
:  Subfile:       < 1 >          2 x 256 (Max Length:  1024 )                  :
:  Row (0=all):  < 0 >                                                         :
:  Start Column: < 1 >                                                         :
:  # of Columns: < 256 >                                                       :
:                                                                              :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                    :
:                                                                              :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:
:                                                                                       :
:    File Name: <B:SEP12C.USR>                          Quit/Continue: *            :
:                                                                                       :
:    8 Comments                                           Subfiles  (Total #: 1 )     :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
: 1> INDIA INK UNWELDED CONTROL                  : Start#      Shape       #Repts :
: 2> Small Aperture                                :    1        2 x 256        1     :
: 3>  SW                                           :                                  :
: 4>                                               :                                  :
: 5>                                               :                                  :
: 6>                                               :                                  :
: 7>                                               :                                  :
: 8>                                               :                                  :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
:  I/O Variable ( R - Z ):                              1024 REAL               :
:                                                                                       :
:  Subfile:       < 1 >         2 x 256 (Max Length:  256 )                  :
:  Row (0=all):   < 0 >                                                            :
:  Start Column:  < 1 >                                                            :
:  # of Columns:  < 256 >                                                          :
:                                                                                       :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                    :
:                                                                                       :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```



IMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

File Name: <B:SEP12D.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 2)

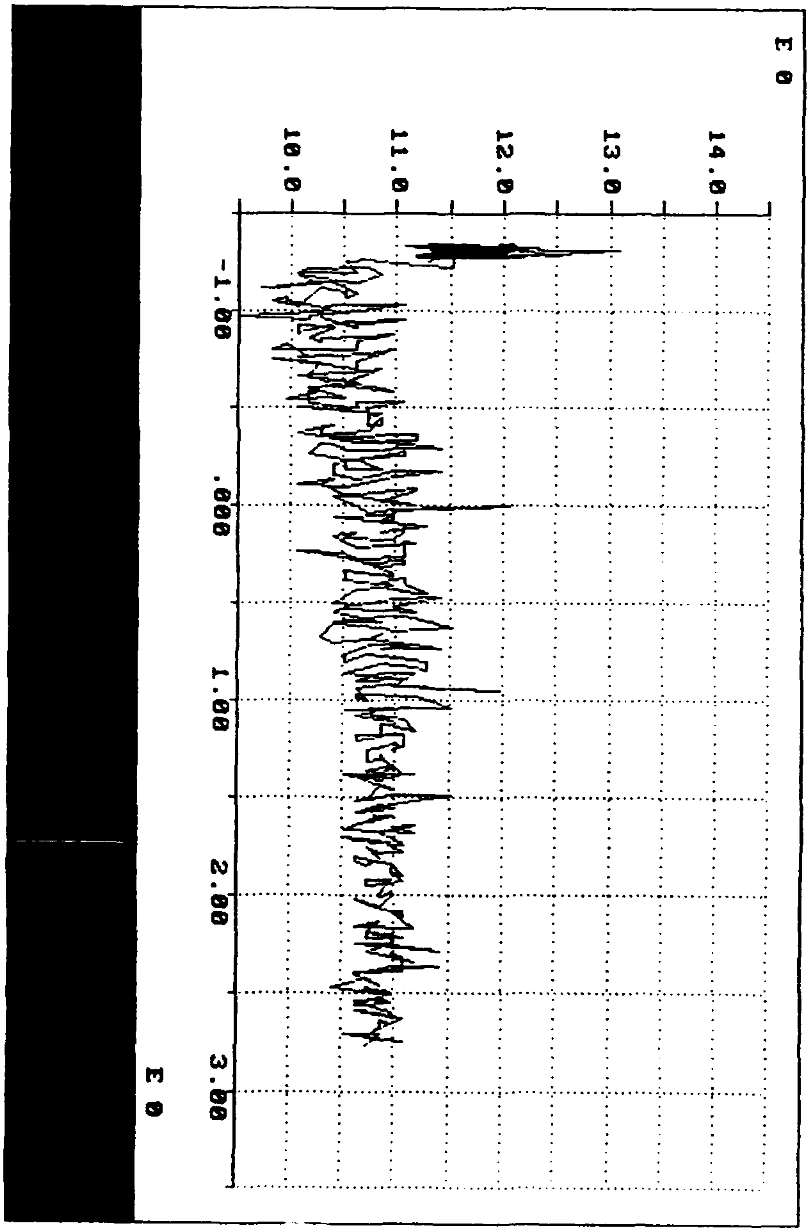
1> INDIA INK CONTROLLED AT 50
2> LOOKS LIKE A WELD
3> NO SMOKE
4> NO BLANCHING
5> WEAK WELD
6> Small Aperture
7> SW
8

Start#	Shape	#Repts
1	2 x 256	2

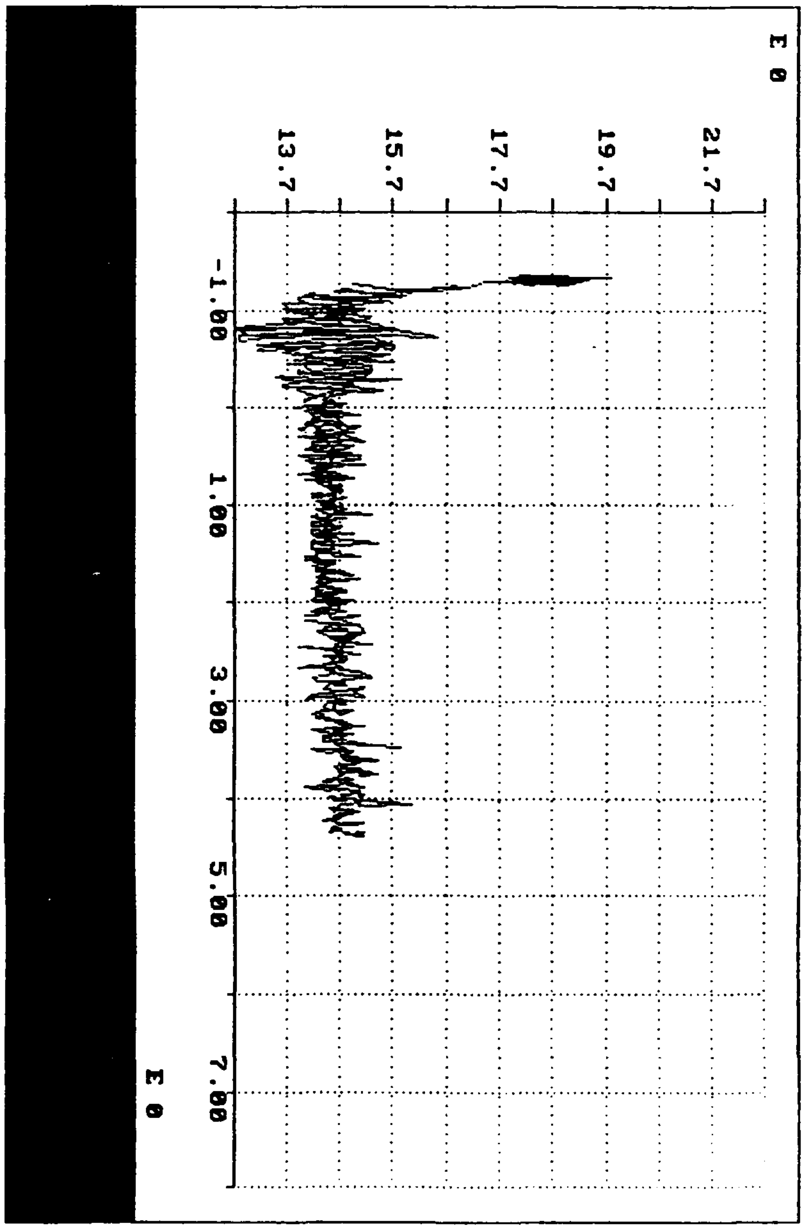
I/O Variable (R - 1): 256 REAL

Subfile: < 1 > 2 x 256 (Max Length: 512)
Row (0=all): < 0 >
Start Column: < 1 >
\# of Columns: < 256 >

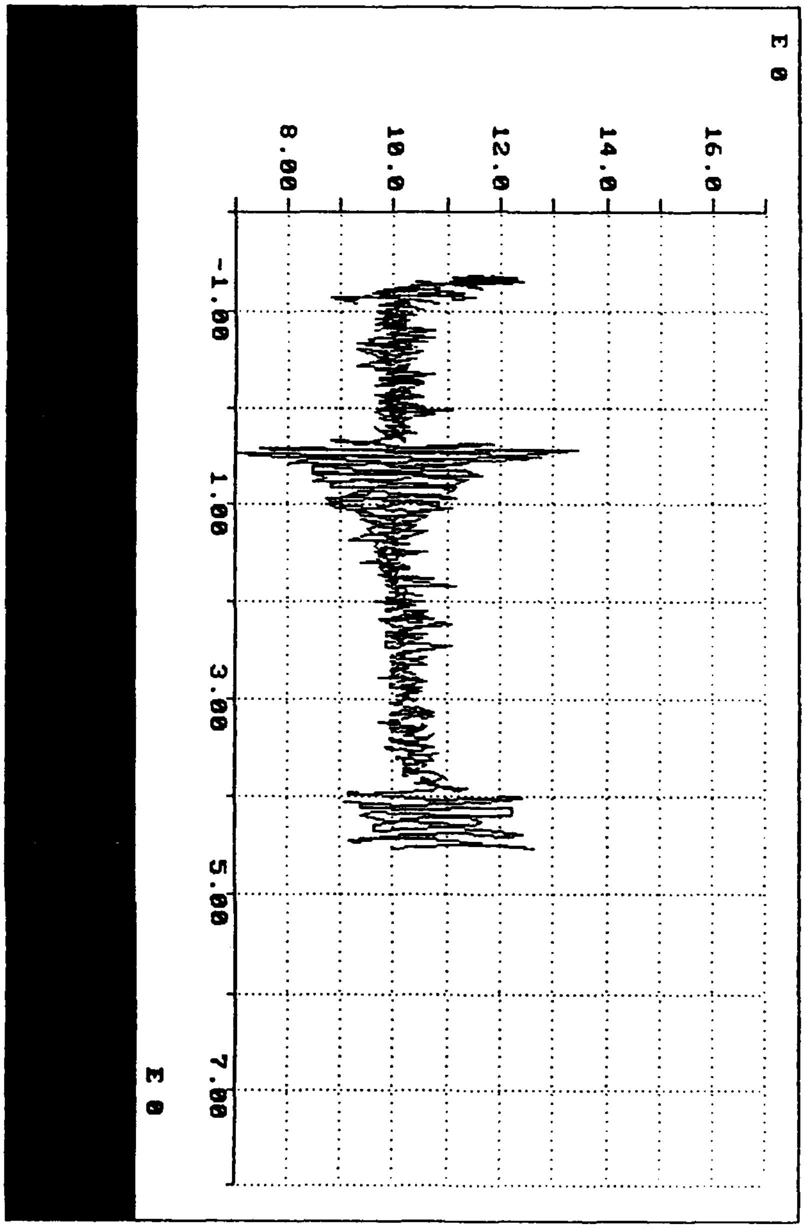
Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:                                                                                      :
:    File Name: <B:SEP12E.USR>                     Quit/Continue: *          :
:                                                                                      :
:    8 Comments                                      Subfiles  (Total #: 3 )        :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
: 1> INDIA INK SMALL APERTURE                : Start#      Shape       #Repts :
: 2> CONTROLLED AT 60                        :    1          2 x 256       3    :
: 3> NO VISUAL CHANGES                       :                                  :
: 4> WEAK WELD                               :                                  :
: 5> Small Aperture                          :                                  :
: 6> SW                                      :                                  :
: 7>                                         :                                  :
: 8>                                         :                                  :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMS
:  I/O Variable ( R - Z ): >                        512 REAL                 :
:                                                                                      :
:  Subfile:      < 1 >              2 x 256 (Max Length:  768 )             :
:  Row (0=all):  < 0 >                                                      :
:  Start Column: < 1 >                                                      :
:  # of Columns: < 256 >                                                    :
:                                                                                      :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *           :
:                                                                                      :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:
:                                                                                      :
:    File Name: <B:SEP12F.USR>                    Quit/Continue: *          :
:
:    8 Comments                                        Subfiles  (Total #: 3 )       :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
: 1> INDIA INK CONTROLLED AT 70                  : Start#      Shape       #Cmnts :
: 2> SLIGHT DESSICATION                          :    1        2 x 256       3     :
: 3> TORE APART FROM SEROSA                       :                                :
: 4> MEDIUM STRONG WELD                           :                                :
: 5> Small Aperture                               :                                :
: 6> SW                                           :                                :
: 7>                                              :                                :
: 8>                                              :                                :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
:  I/O Variable ( R - Z ): >                          768 REAL             :
:                                                                                      :
:  Subfile:       < 1 >            2 x 256 (Max Length:  768 )          :
:  Row (0=all):   < 0 >                                                      :
:  Start Column:  < 1 >                                                       :
:  # of Columns:  < 256 >                                                     :
:                                                                                      :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                :
:                                                                                      :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```



File Input/Output

File Name: <B:SEF12G.USR>   Quit/Continue: *

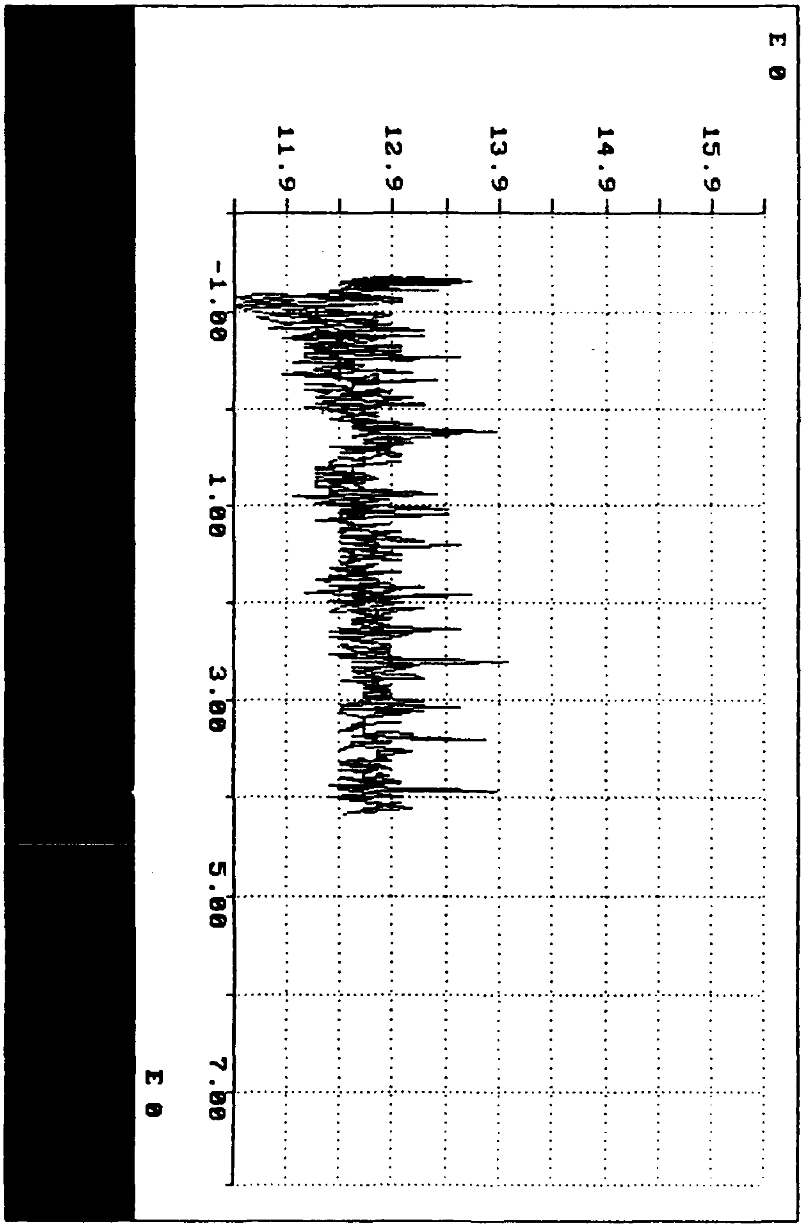
8 Comments   Subfiles (Total #: 1)

Comments	Start#	Shape	#Rents
1> INDIA INK CONTROLLED AT 80			
2> SLIGHT DESSICATION	1	2 x 256	
3> SMALL APERTURE			
4> WEAK WELD			
5> SW			
6>			
7>			
8>			

I/O Variable (R - Z):   768 REAL

Subfile: < 1 >   2 x 256 (Max Length: 768)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



IMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

File Name: <B:SEP12H.USR> Quit/Continue: *

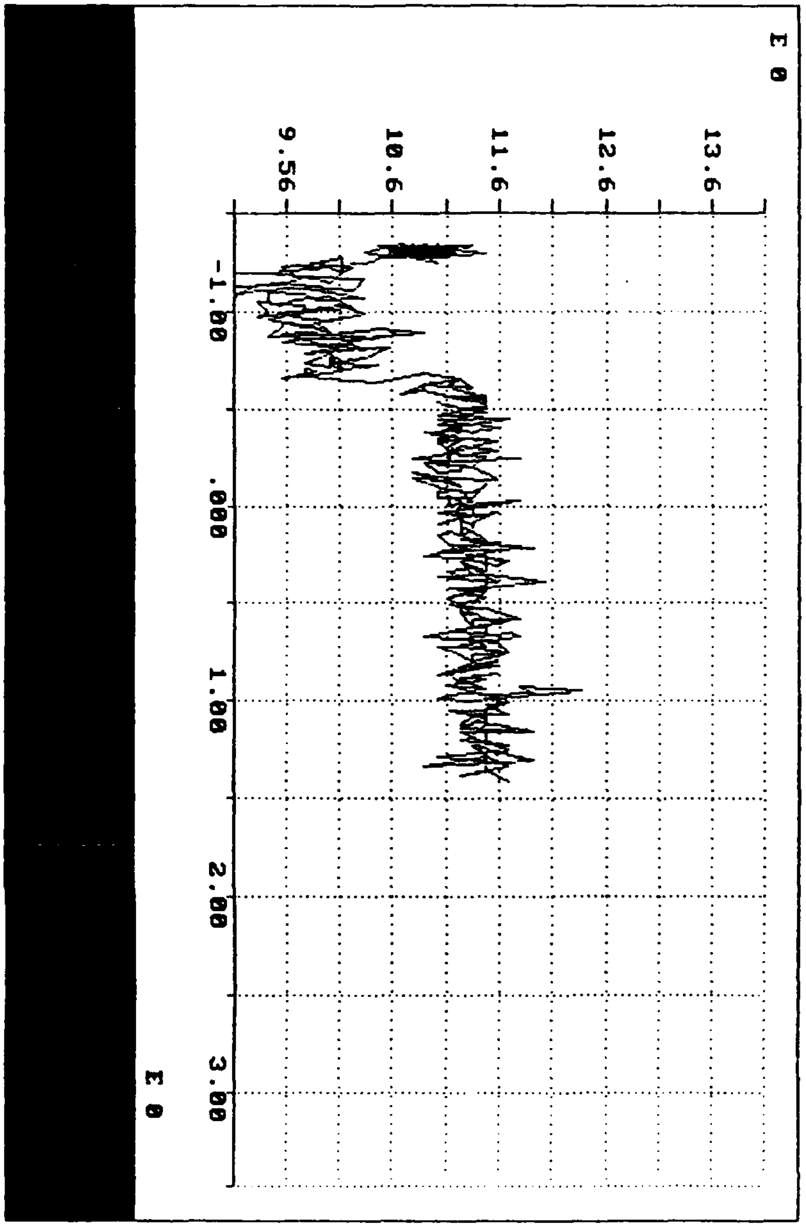
8 Comments Subfiles (Total #: 2)

Comments	Start#	Shape	#Repts
1> INDIA INK CONTROLLED AT 100	1	2 x 256	
2> VERY MINIMAL DESSICATION			
3> SMALL APERTURE			
4> DID NOT APPEAR TO BE WELDED			
5> SW			
6>			
7>			
8>			

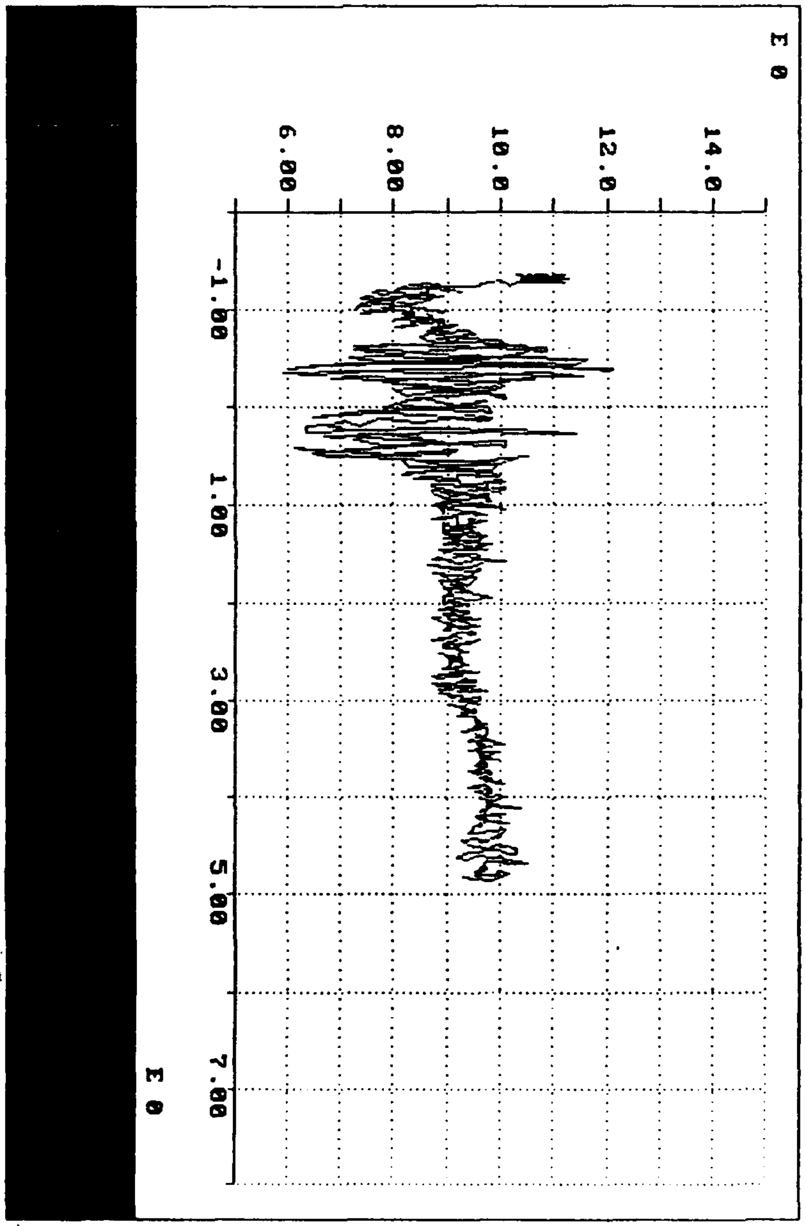
I/O Variable (R - Z): 768 REAL

Subfile: < 1 > 2 x 256 (Max Length: 512)
Row (0=all): < 0
Start Column: < 1
# of Columns: < 256

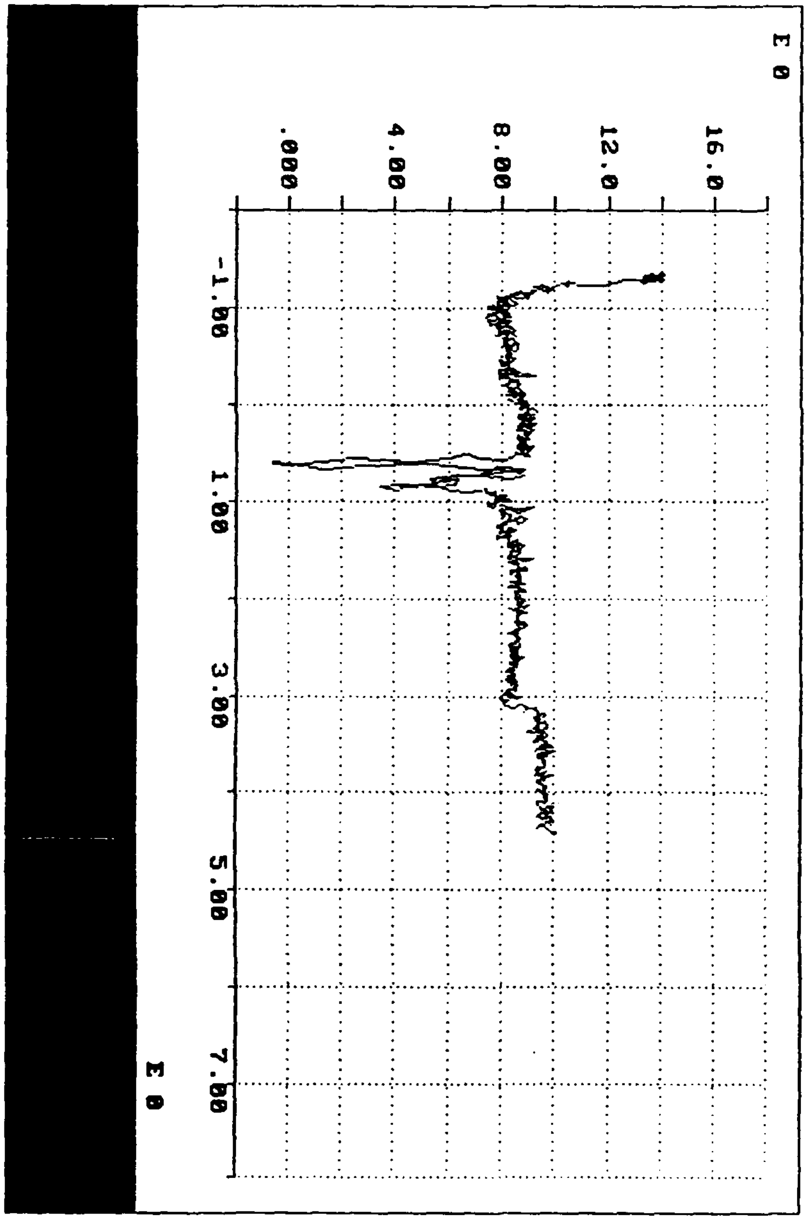
Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:                                                                                        :
:    File Name: <B:SEP12I.USR                         Quit/Continue: *          :
:                                                                                        :
:    8 Comments                                              Subfiles   (Total #:    )   :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
: 1> INDIA INK CONTROLLED AT 100                   : Start#       Shape         #Repts  :
: 2> TC PLACED DEEPER THAN PREVIOUS RUN            :    1          2 x 256               :
: 3> DESSICATION, SMELLS COOKED                    :                                     :
: 4> STILL LOOKS WEAK                              :                                     :
: 5> Small Aperture                                :                                     :
: 6> SW                                            :                                     :
: 7>                                               :                                     :
: 8                                                :                                     :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
:  I/O Variable ( R - Z ):                          512 REAL                        :
:                                                                                        :
:  Subfile:        < 1             2 x 256 (Max Length:  768 )                     :
:  Row (0=all):    < 0                                                                  :
:  Start Column:   < 1                                                                  :
:  # of Columns:  < 256 >                                                               :
:                                                                                        :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                       :
:                                                                                        :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```



```
File Input/Output

File Name: <B:SEP12J.USR>                    Quit/Continue: *

.8 Comments                                  Subfiles  (Total #: 3 )

1> INDIA INK CONTROLLED AT 100               Start#      Shape      #Points
2> DESSICATION AND BLANCHING                   1         2 x 256
3> SMELLS COOKED
4> SMOKE
5> SMALL APERTURE
6> WEAK WELD
7> TORE AT SEROSAL SURFACE
8> SW

I/O Variable ( R - Z ):                      760 REAL

Subfile:        < 1 >              2 x 256 (Max Length:  768 )
Row (0=all):    < 0 >
Start Column:   < 1 >
# of Columns:   < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
```



File Input/Output

File Name: <B:SEF12K.USR   Quit/Continue: *

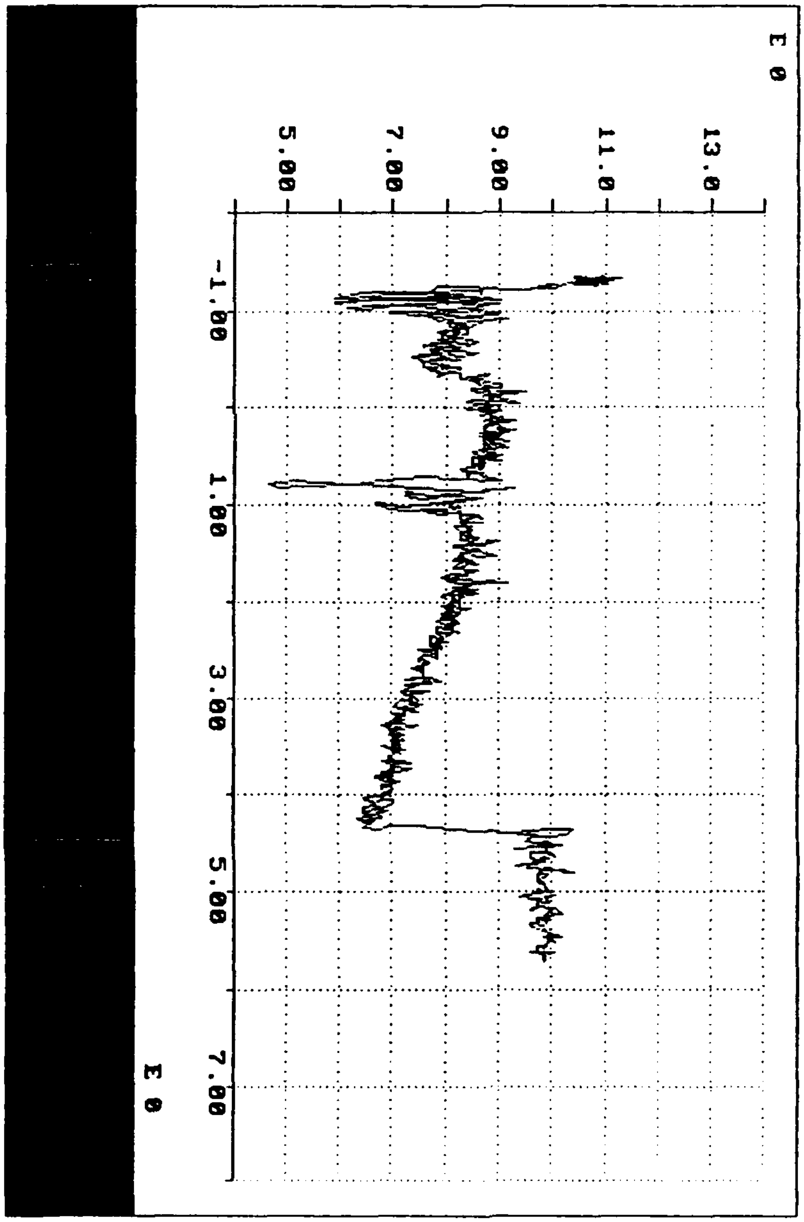
8 Comments   Subfiles (Total #: 1)

: 1> INDIA INK CONTROLLED AT 100   : Start#   Shape   #Plots :
: 2> SMALL APERTURE   : 1   2 x 256
: 3> BURNING, DESSICATION, BLANCHING
: 4> TC MOVED TOWARDS SURFACE
: 5> WEAK WELD
: 6 5W
: 7>
: 8

I/O Variable (F - Z):   ZAB REAL

Subfile: < 1 >   2 x 256 (Max Length: 768)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



IMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:

File Name: <B:SEF12L.USR   Quit/Continue: *

B Comments   Subfiles (Total #: 1)

LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

: 1> INDIA INK CONTROLLED AT 8) : Start# Shape #Repts :
: 2> NOT MUCH OF A VISUAL CHANGE : 1 2 x 256 :
: 3> SMALL APERTURE :
: 4> WEAK WELD :
: 5> SW :
: 6> :
: 7> :
: 8> :

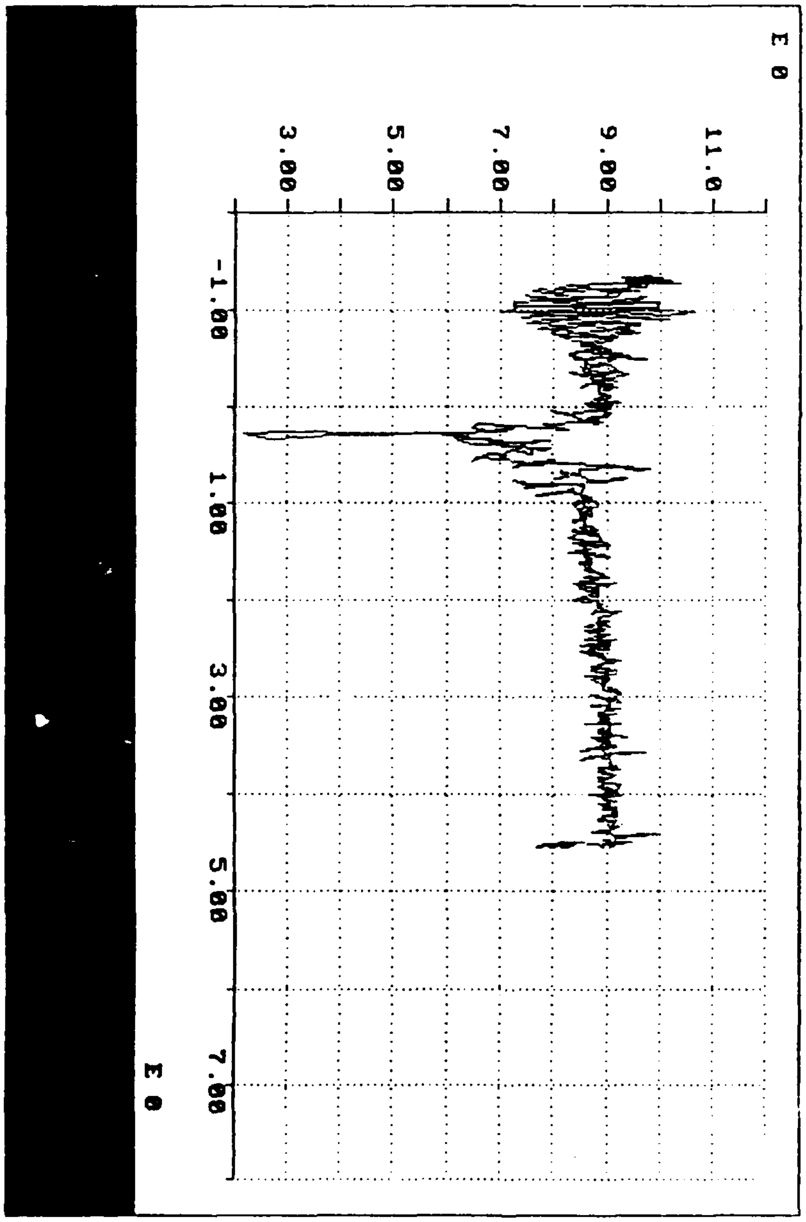
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

: I/O Vari ble (R - Z): 768 REAL :

: Subfile: < 1 > 2 x 256 (Max Length: 768) :
: Row (0=all): < 0 > :
: Start Column: < 1 > :
: # of Columns: < 256 > :

: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: * :

HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM



IMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

File Name: <B:SEP12M.USR> Quit/Continue: *

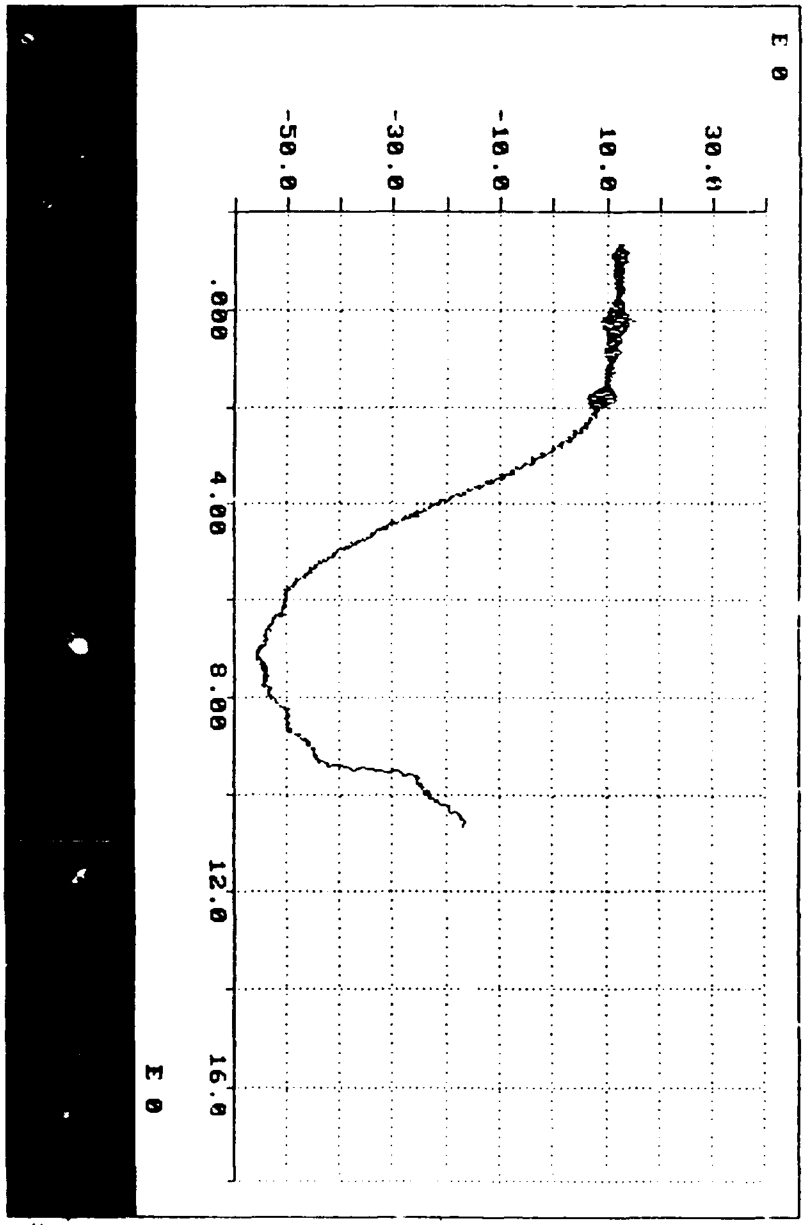
8 Comments Subfiles (Total #: 4)

8 Comments	Start#	Shape	#Points
1> ONE STRIP CONTROL UNWELDED			
2> LARGE APERTURE	1	2 x 256	4
3> BROKE AT CLAMP			
4> NO SLIPPAGE			
5> 5W			
6>			
7>			
8>			

I/O Variable (R - Z): 768 REAL

Subfile: < 1 > 2 x 256 (Max Length: 1024)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;

File Name: <B:SEPION.USR Quit/Continue: *

8 Comments Subfiles (Total #: 2)

LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

: 1 TWO STRIP CONTROL UNWELDED : Start# Shape #Repts :
: 2 LARGE APERTURE : 1
: 3 SW :
: 4 :
: 5 :
: 6 :
: 7 :
: 8 :

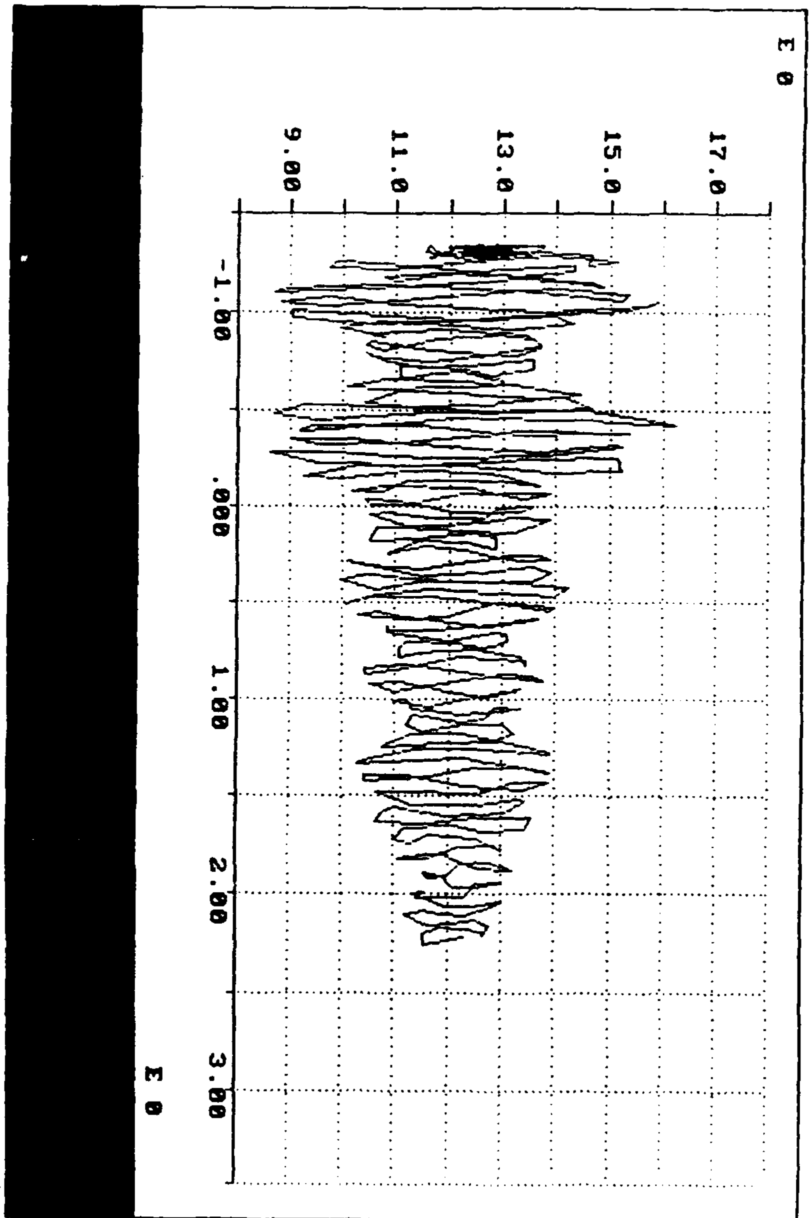
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

: I/O Variable (R - Z): 1024 REAL :

: Subfile: < 1 > 2 x 256 (Max Length: 512) :
: Row (0=all): < 0 > :
: Start Column: < 1 > :
: # of Columns: < 256 > :

: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: * :

HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM



File Input Output

File Name: <B:SEP120.USR   Quit/Continue: *

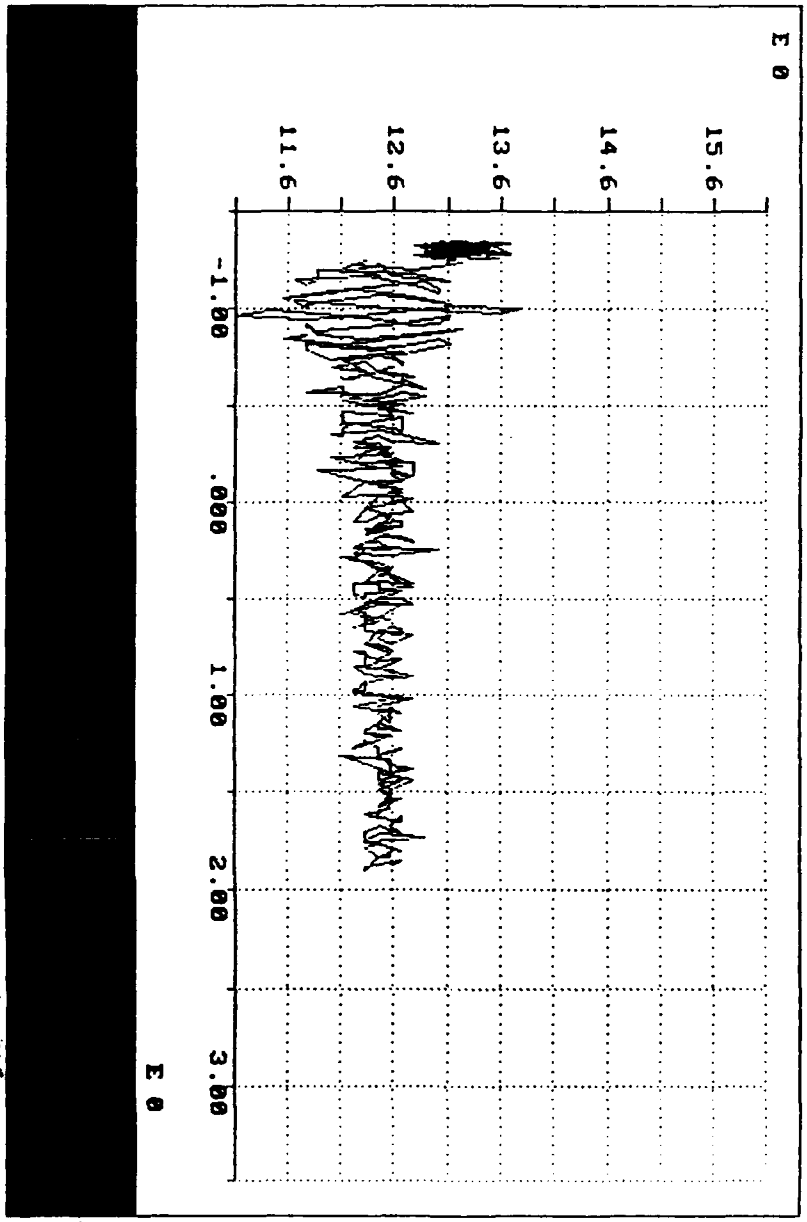
8 Comments   Subfile: (Total #: 1)

1> TWO STRIP INDIA INK UNWELDED CONTROL	Start#	Shape	#Points
2> large aperture	1	2 x 256	2
3> SW			
4>			
5>			
6>			
7>			
8>			

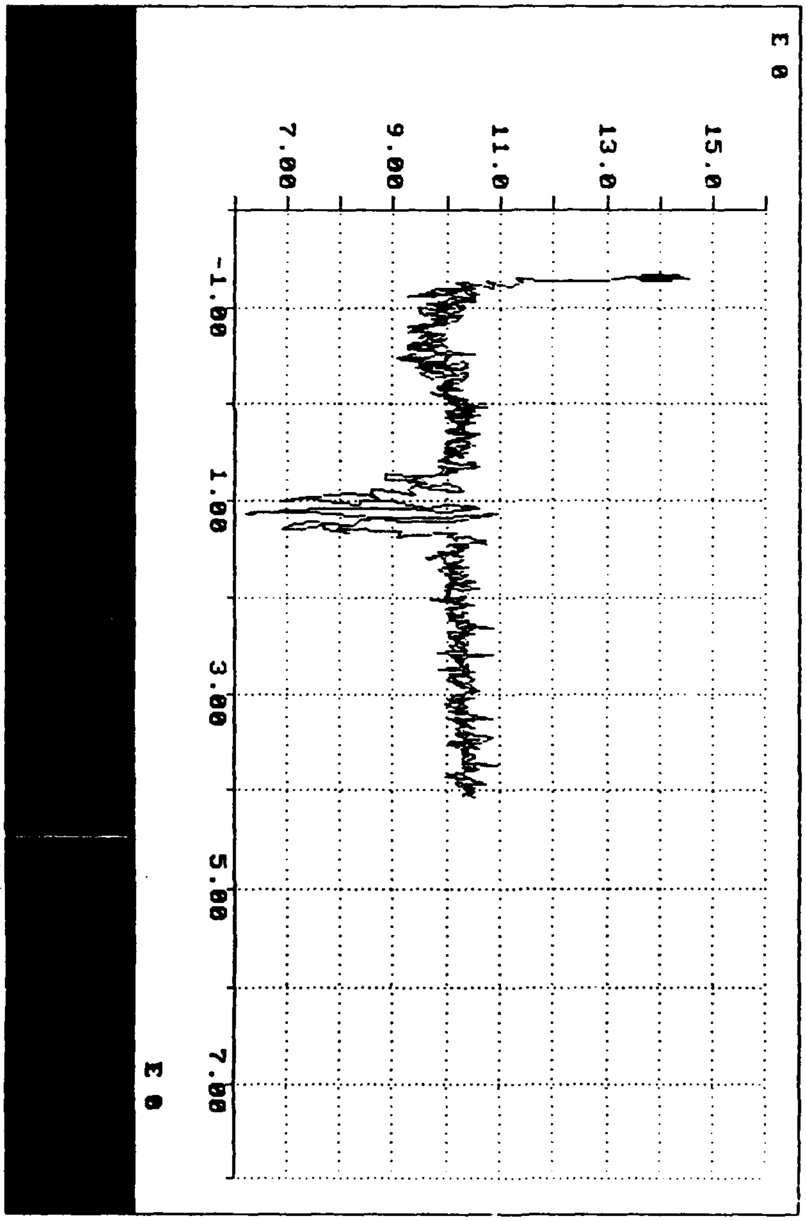
I/O Variable (R - Z):   512 REAL

Subfile: < 1   2 x 256 (Max Length: 512)
Row (0=all): < 0 >
Start Column: < 1
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
:                                                                                    :
:    File Name: <B:SEP12F.USR>                         Quit/Continue: *           :
:                                                                                    :
:    8 Comments                                        Subfiles  (Total #: 1)      :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
: 1> INDIA INK CONTROLLED AT 50                 : Start#      Shape       #Reps :
: 2> LARGE APERTURE                             :    1        2 x 256           :
: 3> NO VISUAL CHANGES                          :                               :
: 4> DID NOT LOOK WELDED                        :                               :
: 5> SW                                         :                               :
: 6>                                            :                               :
: 7>                                            :                               :
: 8>                                            :                               :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
:  I/O Variable ( R - Z ):                          512 REAL                      :
:                                                                                    :
:  Subfile:        < 1 >          2 x 256 (Max Length:  768 )                    :
:  Row (0=all):    < 0 >                                                            :
:  Start Column: < 1                                                                :
:  # of Columns: < 256                                                              :
:                                                                                    :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                       :
:                                                                                    :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```



File Input/Output

File Name: <B:SEP120.USR   Quit/Continue: *

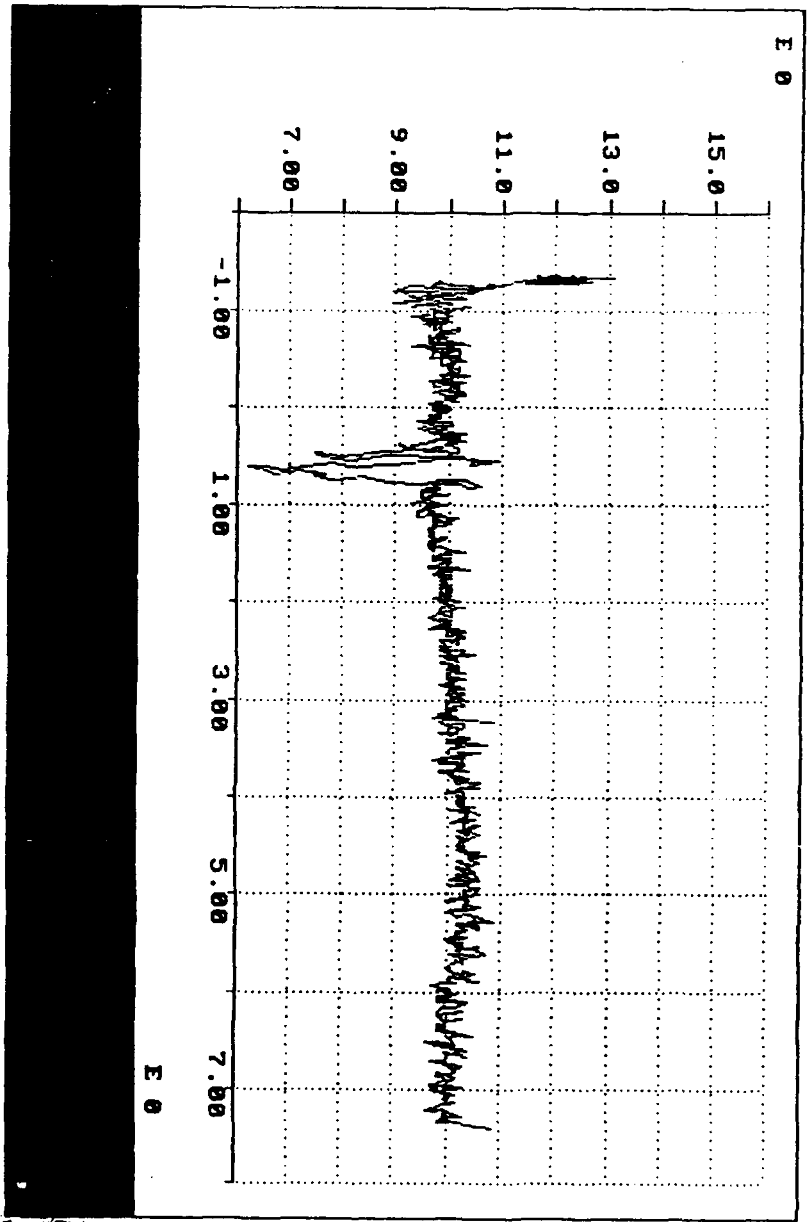
8 Comments   Subfiles (Total #: 4)

1> INDIA INK CONTROLLED AT   Start#
2> LARGE APERTURE   1
3> SMOKING.DESSICATION
4> TC MAY BE A LITTLE TOO DEEP
5> BETTER, BUT STILL A
6> SW
7>
8>

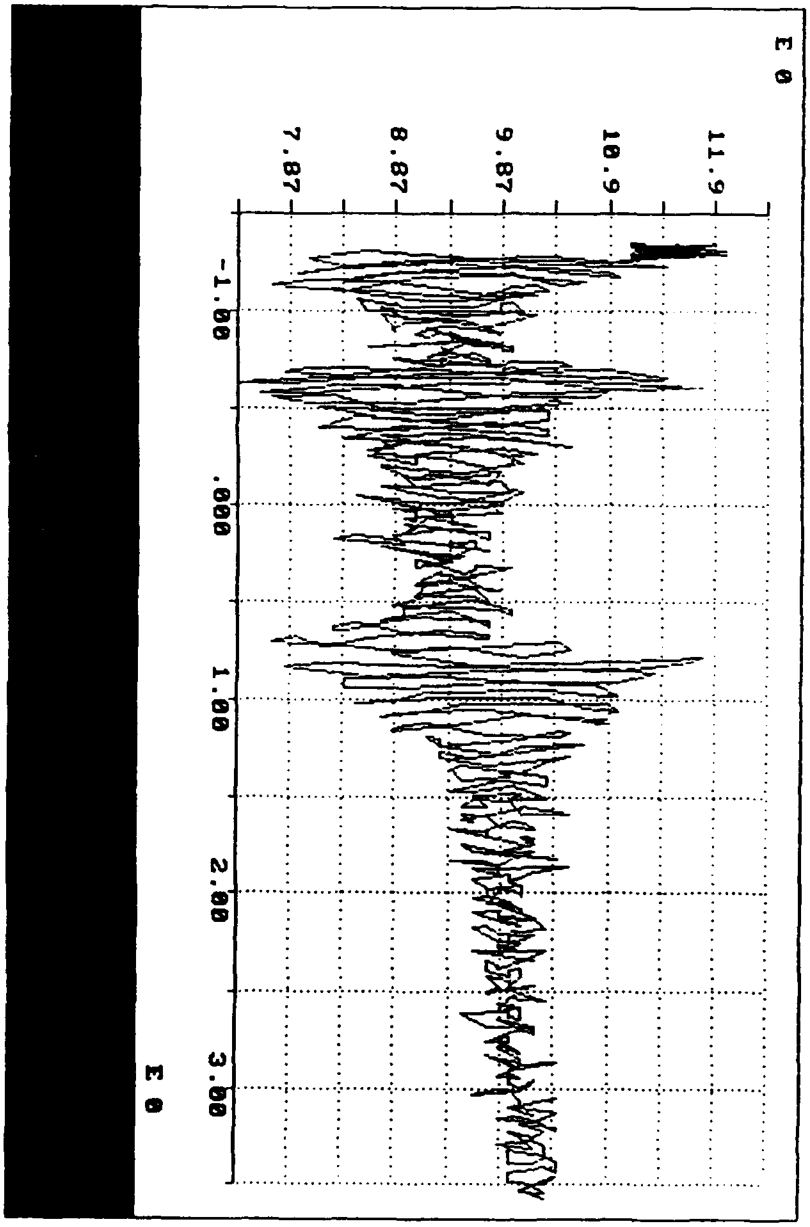
I/O Variable (R - Z):   Z/B REAL

Subfile: < 1 >   2 x 256 (Max Length: 1024)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
File Input/Output

File Name: <B:SEP12R.USR                    Quit/Continue: *

8 Comments                                  Subfiles (Total #: 1 )

1> INDIA INK SET=70 TC MAX=60              Start#     Shape      #Repts
2> LARGE APERTURE                             1       2 x 256
3> SLIGHT DESSICATION
4> WEAK WELD
5> 5W
6>
7>
8>

I/O Variable ( R - Z ):                     1024 REAL

Subfile:          < 1 >          2 x 256 (Max Length: 768 )
Row (0=all):    < 0 >
Start Column: < 1 >
# of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
```



File Input/Output

File Name: <B:SEP12S.USR> Quit/Continue: *

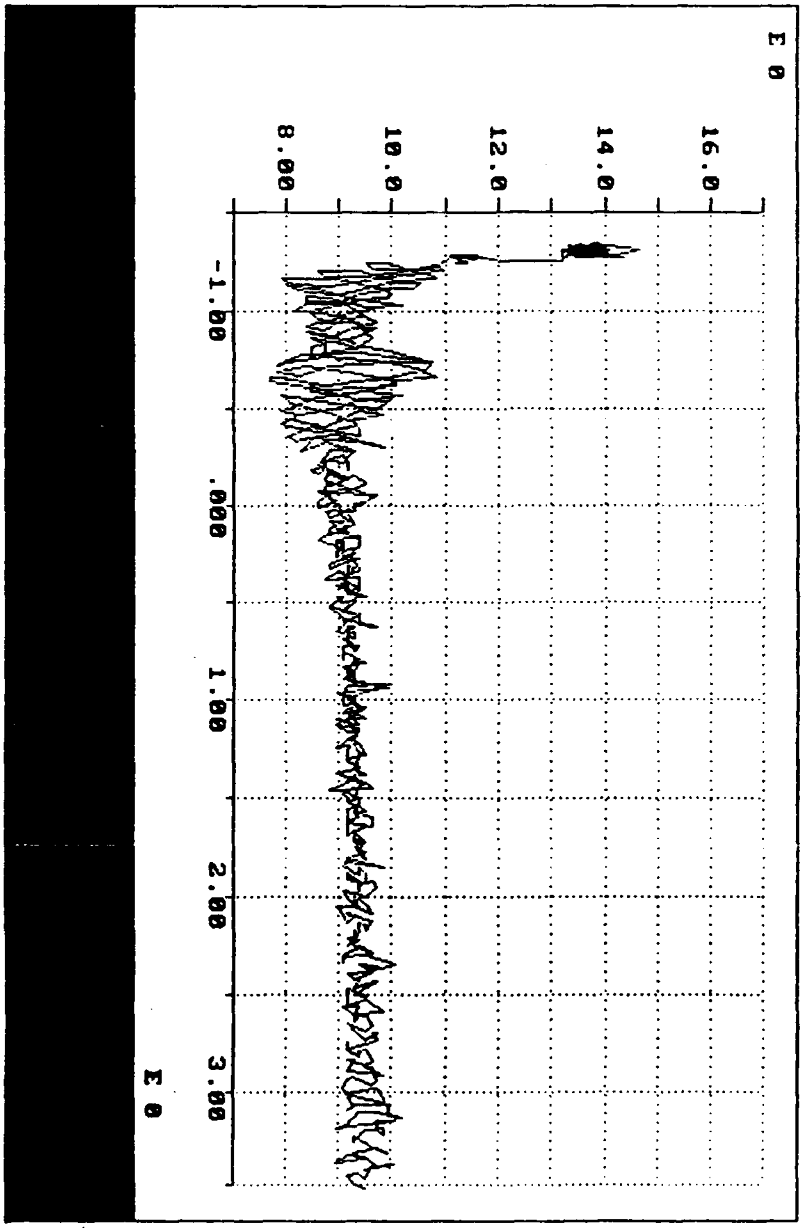
8 Comments Subfiles (Total #: 3)

Comments	Start#	Shape	#Pts
1> INDIA INK CONTROLLED AT 70	1	3 x 256	
2> LARGE APERTURE			
3> MINIMAL DESSICATION			
4> NOT IMPRESSIVE WELD-WELD			
5> 5W			
6>			
7>			
8			

I/O Variable (R - Z): 768 REAL

Subfile: < 1 > 3 x 256 (Max Length: 768)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Name: <B:SEP121.USR

Quit/Continue: *

8 Comments

Subfiles (Total #: 3)

1> INDIA INK CONTROLLED AT 80
2> LARGE APERTURE
3> SLIGHT DESSICATION
4> WELDED, BUT NOT IMPRESSIVE
5> WEAK WELD
6> SW
7>
8>

Start#	Shape	#Repts
1	2 x 256	

I/O Variable (R 2):

Subfile: < 1 >

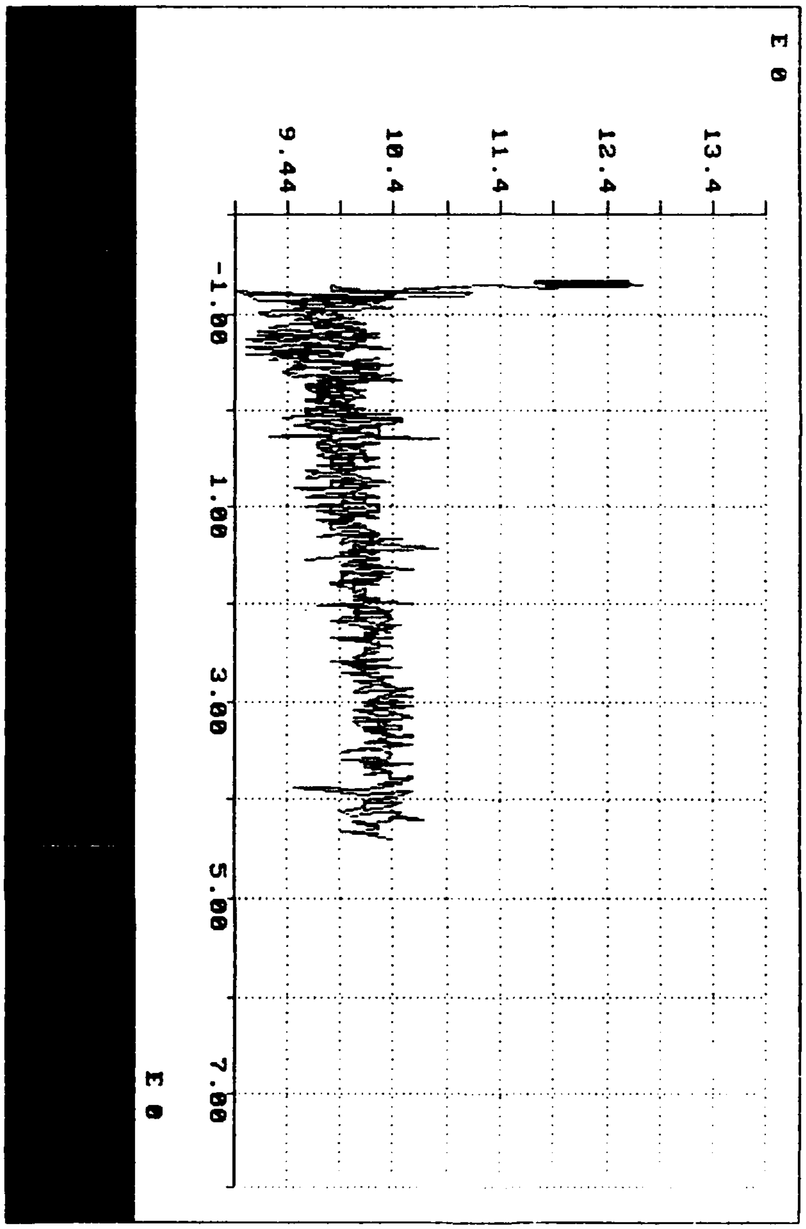
2 x 256 (Max Length: 768)

Row (0=all): < 0 >

Start Column: < 1 >

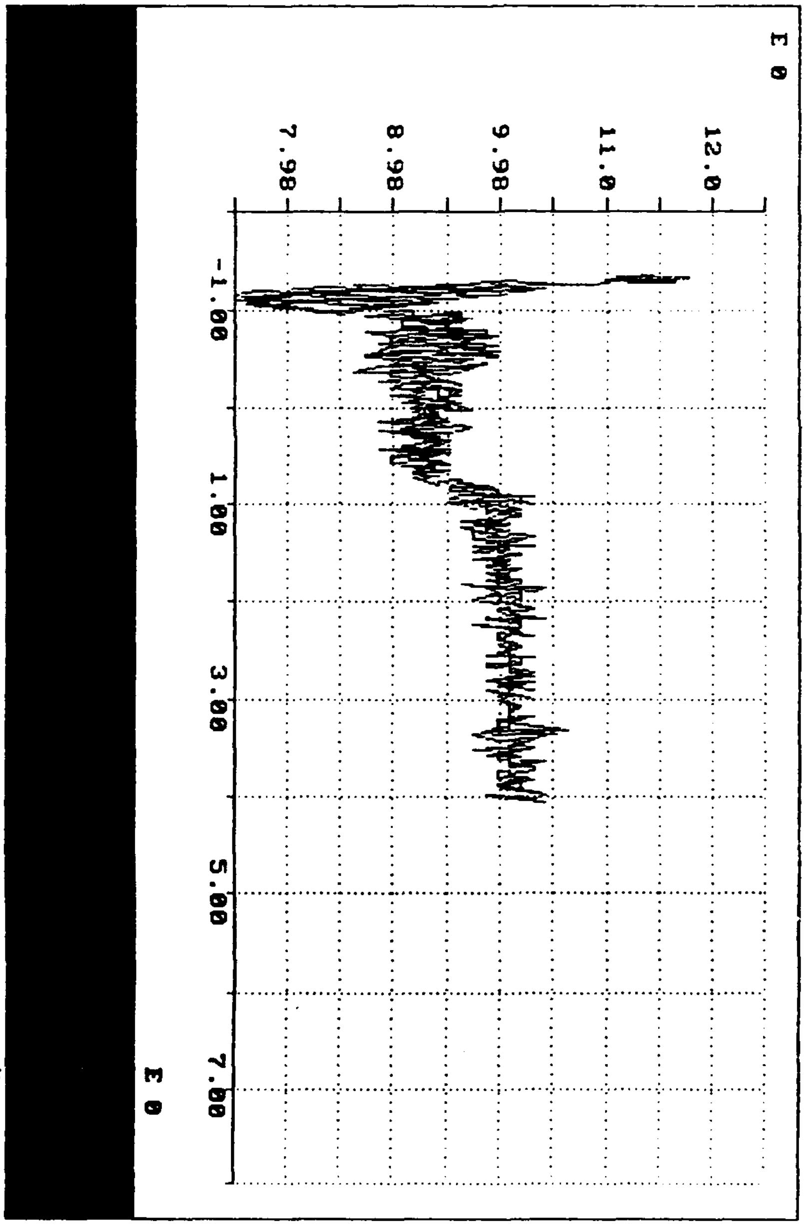
# of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Input/Output

```
:   File Name: <B:SEP12U.USR>                       Quit/Continue: *          :
:
:   8 Comments                                      Subfiles  Total #: 1      :
: 1> INDIA INK SET=100,1C MAX=V2          : Start#       Shape        #Reps
: 2> LARGE APERTURE                       .    1
: 3> SOME BLANCHING AND DEPOSITION        :
: 4> WEAK WELD                            :
: 5>  5W                                  :
: 6>                                      :
: 7>                                      :
: 8>                                      :
:  I/O Variable ( R - Z ):                          768 REAL              :
:
:  Subfile:       < 1              2 x 256 (Max Length:  768 )            :
:  Row (0=all):   < 0 >                                                   :
:  Start Column: < 1 >                                                    :
:  # of Columns: < 256 >                                                  :
:
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *               :
:
```



File Input/Output

File Name: <B:SEP12V.USR>   Quit/Continue: *

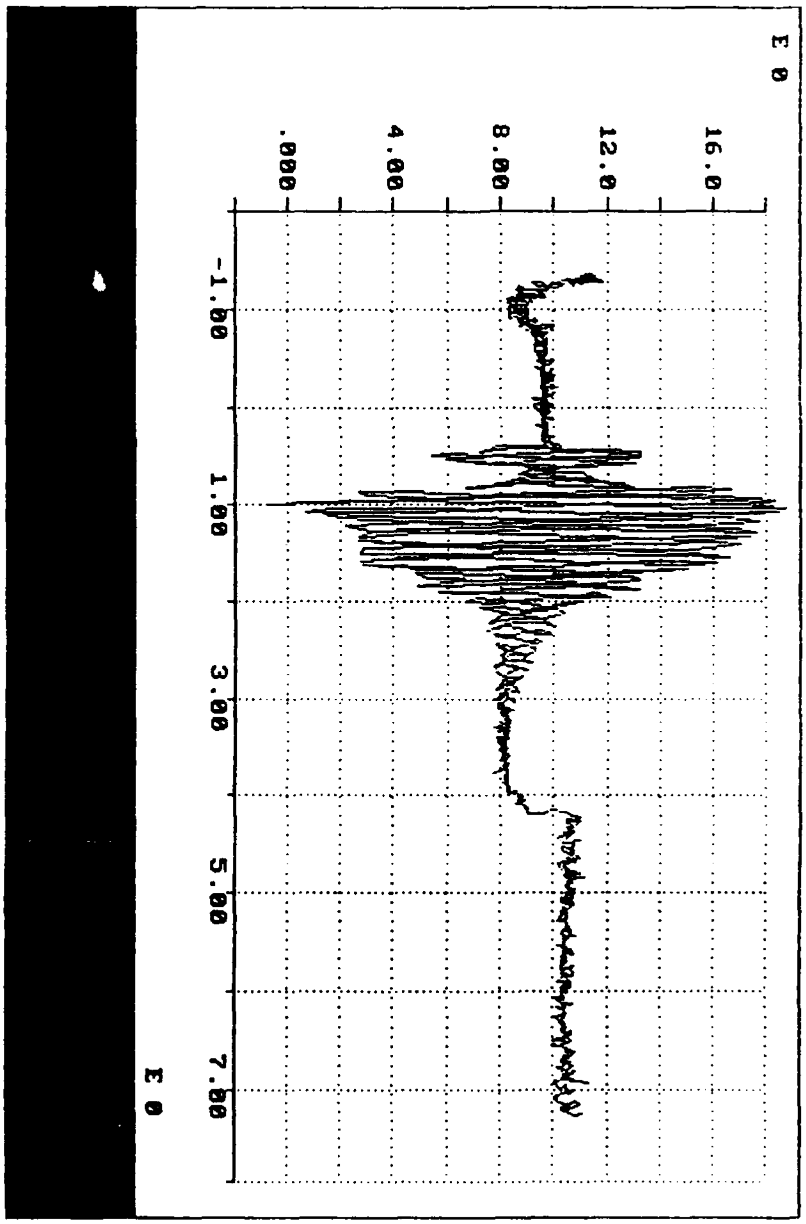
8 Comments   Subfiles (Total #: 4)

Comments	Start#	Shape	#Repts
1> INDIA INK SET=100, IC MAX=?	1	2 x 256	4
2> LARGE APERTURE			
3> SLIGHT DESSICATION,SMOKING			
4> A WELD			
5> BD MOVED APPARATUS DURING FULL SCAN			
6> 5W			
7>			
8>			

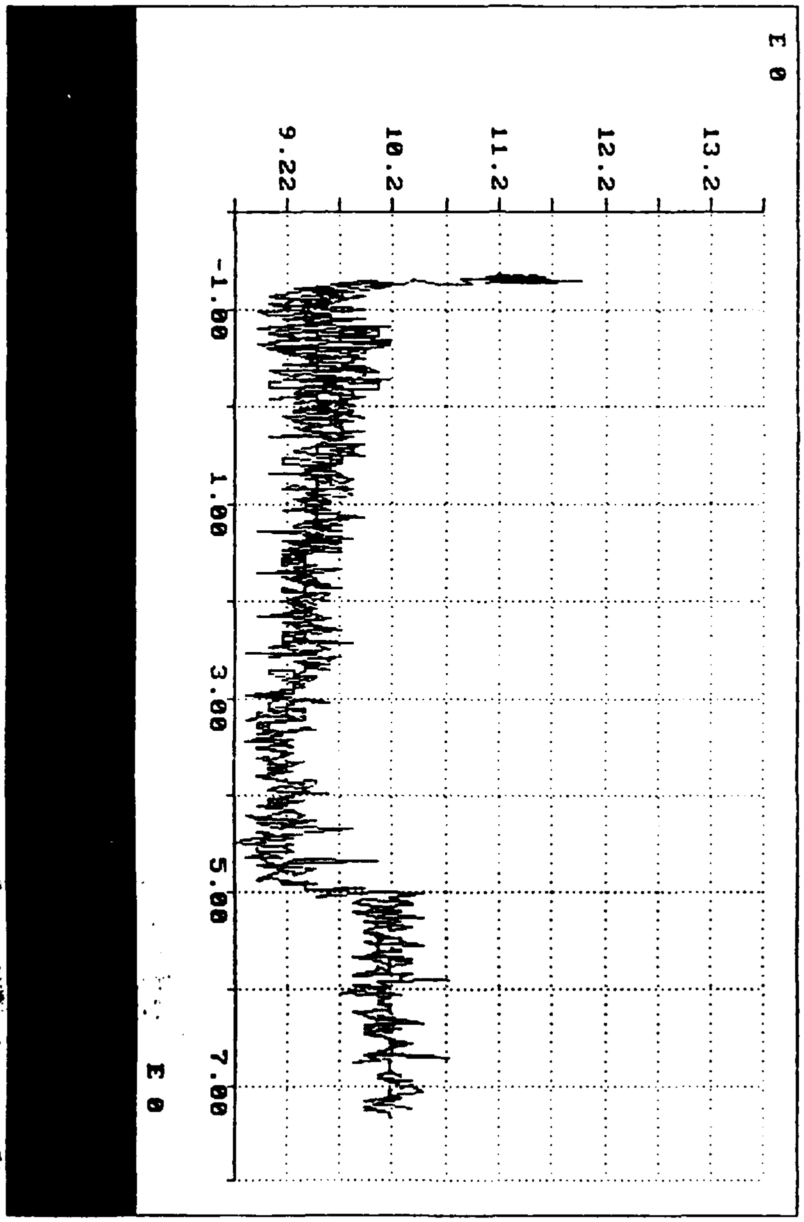
I/O Variable (R - Z):   769 REAL

Subfile: < 1 >   2 x 256 (Max Length: 1024)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
File Input/Output
File Name: B:SEP12W.USR                         Quit/Continue: *
8 Comments                                      Subfiles (Total #: 4)
1> INDIA INK CONTROLLED AT 100                  Start#    Chans    #Reps
2> TOOK A FEW SECONDS TO REACH                  1         1 x 256  4
3> CONTROL TEMP
4> SOME DESSICATION AND BLANCHING
5> WEAK WELD
6> large aperture
7> SW
8
I/O Variable ( R - Z ):                         10.4 REAL
Subfile: < 1         1 x 256 (Max Length: 1024)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >
Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
```



File Input/Output

File Name: <C:SEP14A.USR> Quit/Continue: *

8 Comments Subfiles (Total #: 3)

1> ONE STRIP UNWELDED CONTROL	Start#	Shape	#Repts
2> BROKE AT THE CLAMP	1	3 x 256	
3> NO SLIPPAGE			
4			
5			
6			
7			
8			

I/O Variable (R - Z): 768 REAL

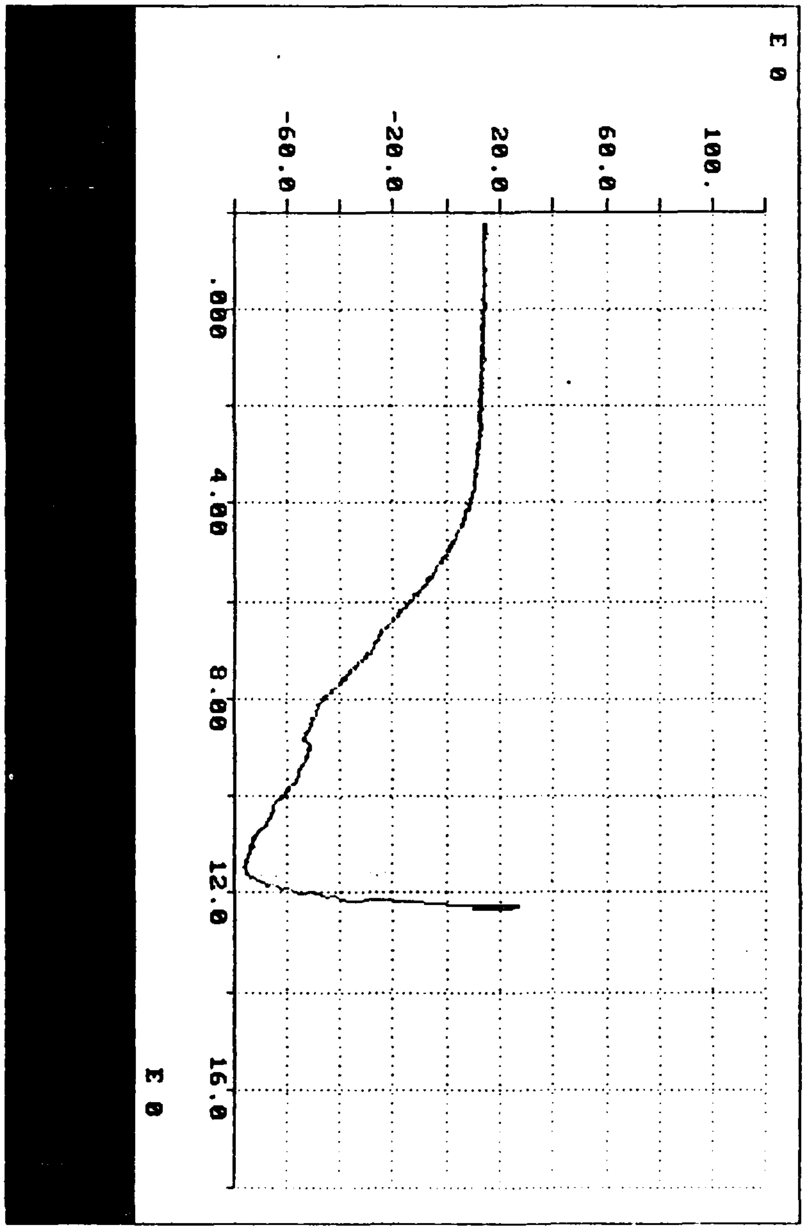
Subfile: < 1 > 3 x 256 (Max Length: 768)

Row (0=all): < 2 >

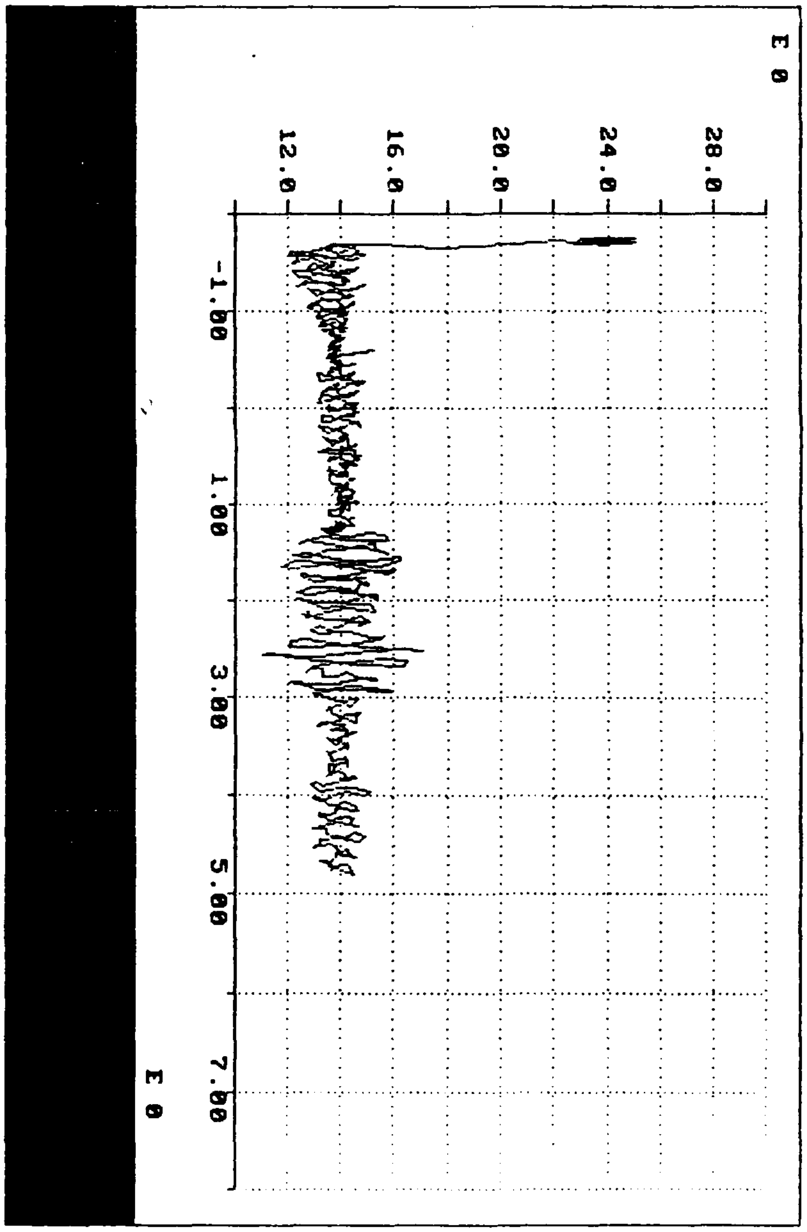
Start Column: < 1 >

# of Columns: < 768 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM:
:                                                                          :
:    File Name: <C:SEP14B.USR>                      Quit/Continue: *       :
:                                                                          :
:    8 Comments                                       Subfiles  (Total #:  :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
: 1> TWO STRIP UNWELDED CONTROL          : Start#      Shape       #Repts  :
: 2>                                     :     1        2 x 256            :
: 3>                                     :                                 :
: 4.                                     :                                 :
: 5>                                     :                                 :
: 6.                                     :                                 :
: 7                                      :                                 :
: 8.                                     :                                 :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
:  I/O Variable ( R - 7 ):                           768 REAL              :
:                                                                          :
:  Subfile:        1                  2 x 256 (Max Length:  768            :
:  Row (0=all):     0                                                      :
:  Start Column:    1                                                      :
:  # of Columns:    256                                                    :
:                                                                          :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                :
:                                                                          :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```



File Input/Output

File Name: <C:SEF140.[illegible]   Quit/Continue: *

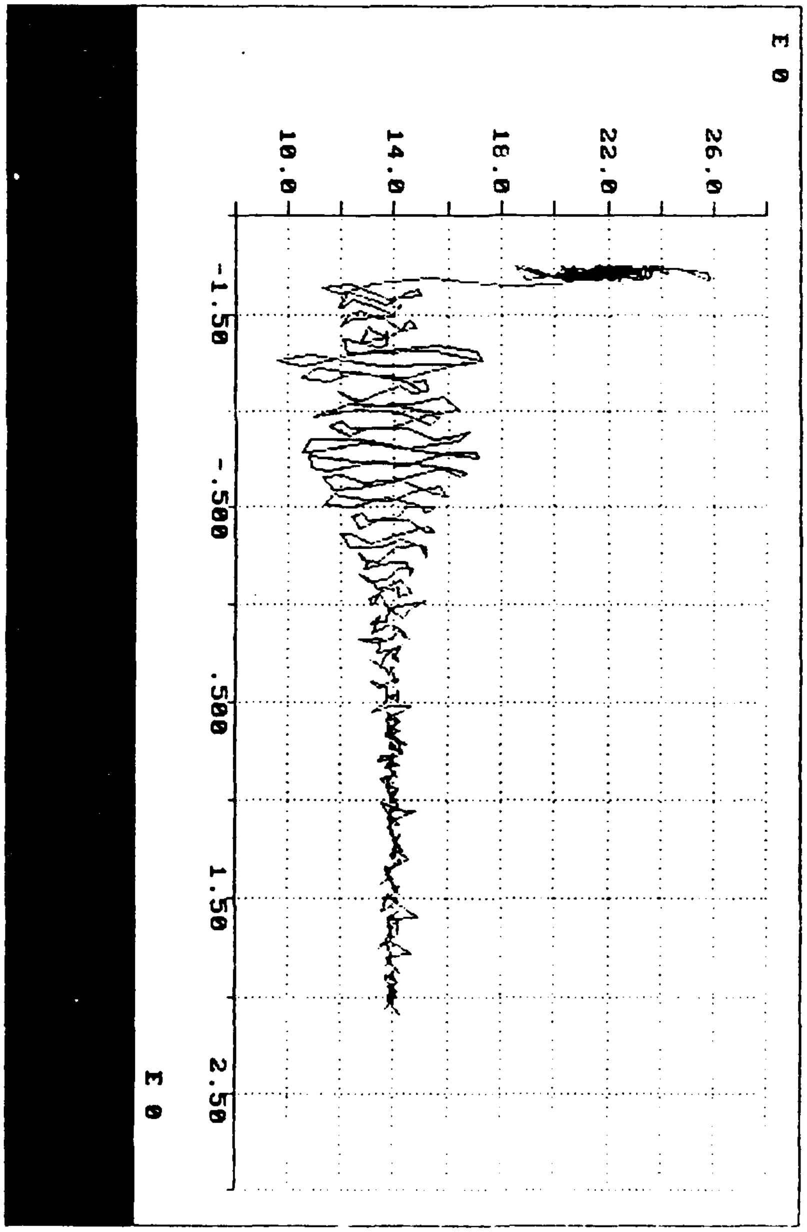
8 Comments   Subfiles (Total #: [illegible]

1	INDIA INK UNWELDED	Start#	Shape	[illegible]
2	BD LEANED ON TABLE [illegible]	1	2 × 256	
3				
4				
5				
6				
7				
8				

I/O Variable (R - Z):   768 REAL

Subfile: < 1 >   2 × 256 (Max Length: 512)
Row (0=all): < 0
Start Column: 1
# of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file Quit: *



File Input/Output

File Name: C:SEP14D.JSF   Quit/Continue: *

8 Comments   Subfile

Comment	Start#	Shape	#Fcols
1 INDIA INK CONTROLLED AT			
2 NO VISUAL CHANGES	1	2 x 256	
3 NO SMOKE			
4 NO OBVIOUS WELDING			
5 BOWEL LOOKS GOOD			
6			
7			
8			

I/O Variable (F - Z):

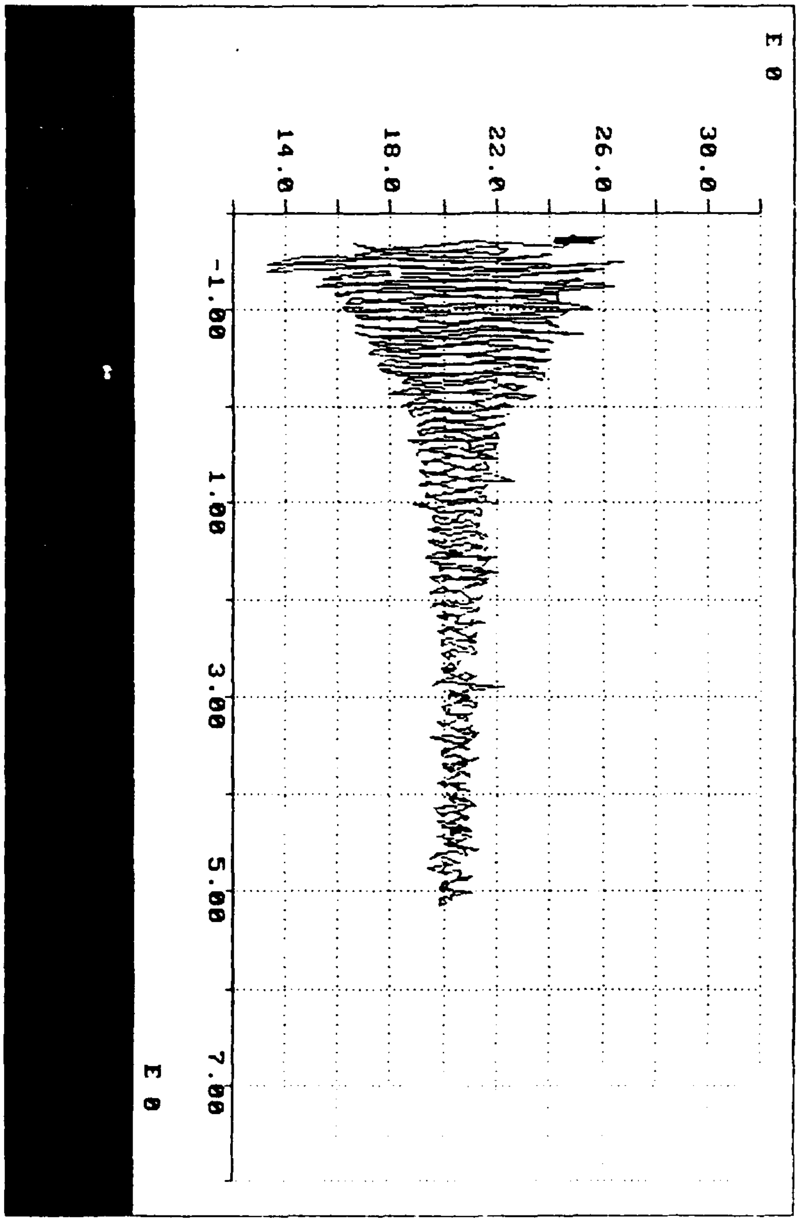
Subfile: 1   2 x 256 (Ga Length:

Row (0=all): 0

Start Column: 1

# of Columns: 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Input/Output

File Name: <C:SEP14E.USR   Quit/Continue: *

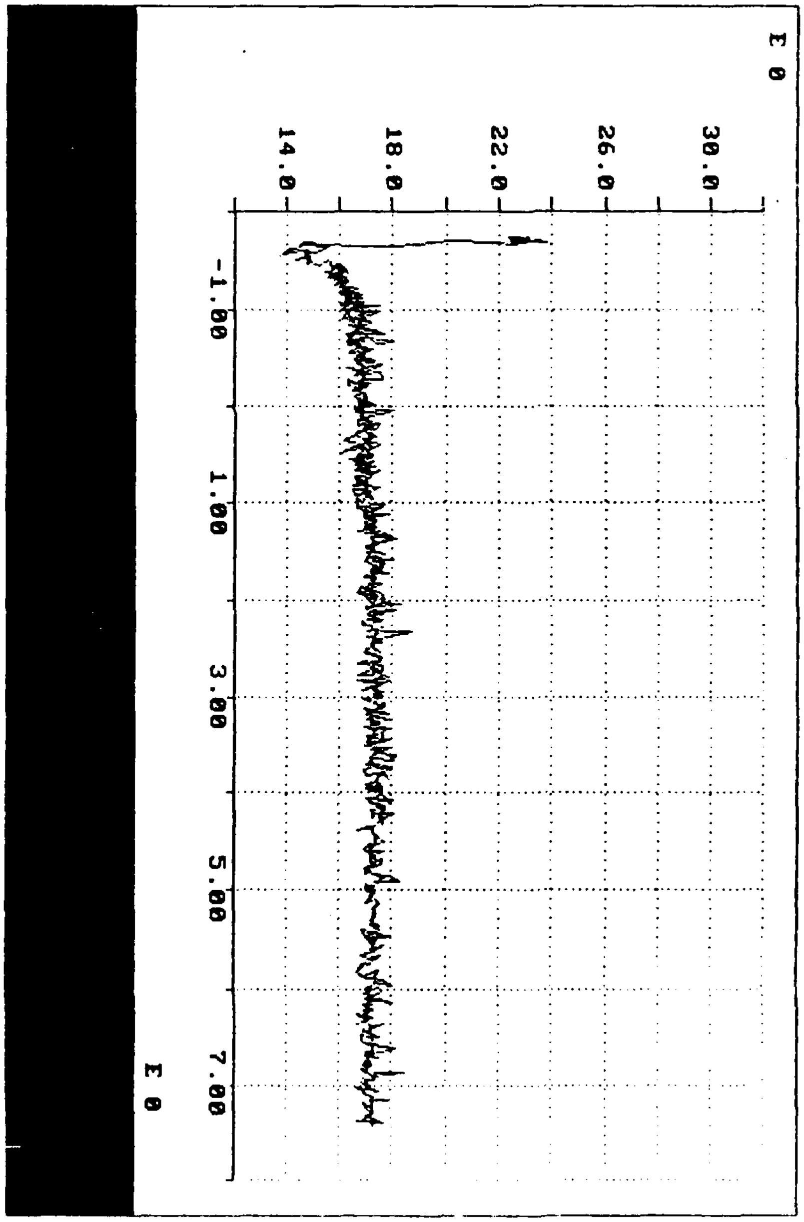
8 Comments   Subfiles (Total #:)

1	INDIA INK CONTROLLED AT 60	Start#	Shape	#Cpts
2	NO VISUAL CHANGES	1	2 x 256	
3	NO SMOKE			
4				
5	WEAK WELD			
6	SMOKE FROM SECOND [illegible]			
7				
8				

I/O Variable (R - Z):   768 REAL

Subfile: < 1 >   2 x 256 (Max Length: 768)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Input/Output

File Name: <C:SEP14F.USR   Quit/Continue: *

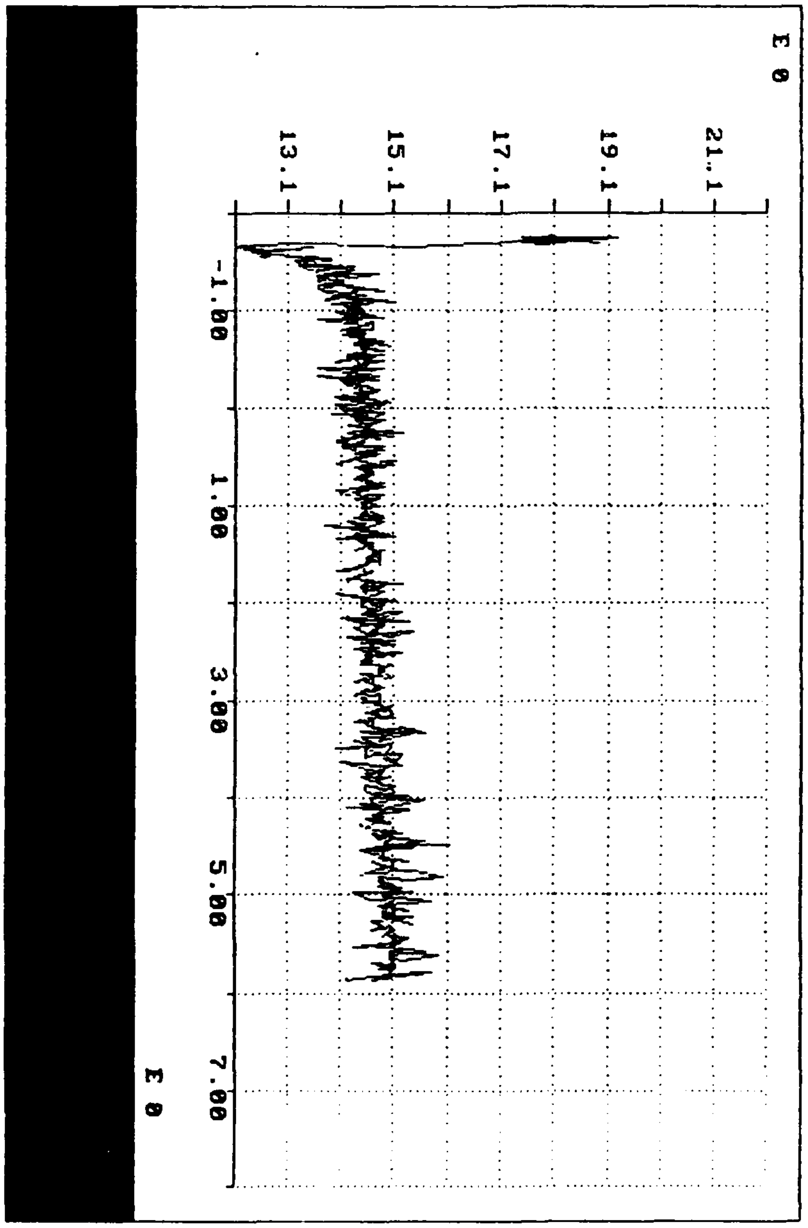
9 Comments   Subfiles (Total #: 3)

1 INDIA INK CONTROLLED AT 20   Start#   Shape   #Plots
2 SLIGHT DESSICATION   1   3 x 256   3
3 MINIMAL BLANCHING
4
5 LOOKED LIKE A WELD
6 NO SMOKE
7
8

I/O Variable (R - Z):   768 REAL

Subfile: < 1 >   3 x 256 (Max Length: 768)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Input/Output

File Name: <C:SEP14G.USR>   Quit/Continue: *

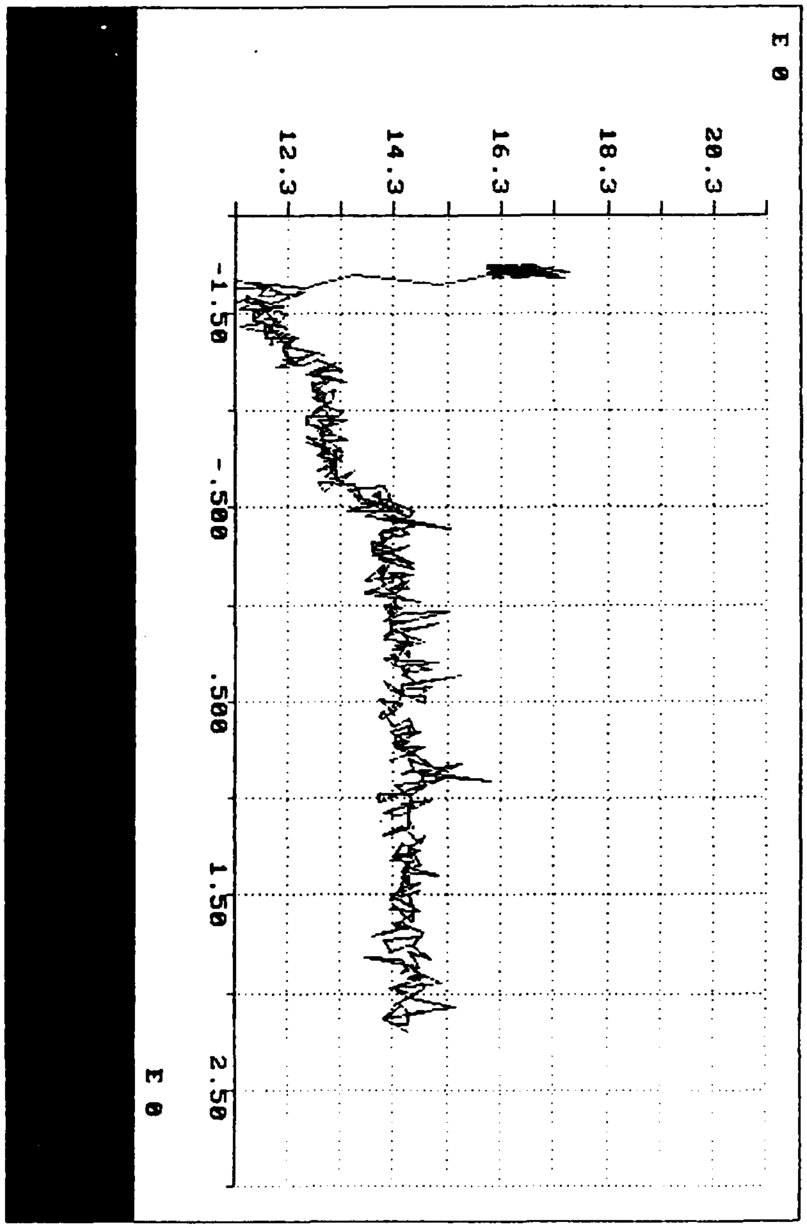
8 Comments   Subfiles (Total #: ?)

: 1) INDIA INK CONTROLLED AT 80   : Start#   Shape   #Repts :
: 2) SOME BLANCHING   : 1   2 × 256
: 3) NO SMOKE
: 4) LITTLE DESSICATION
: 5)
: 6) NO WELD SEEN
: 7)
: 8

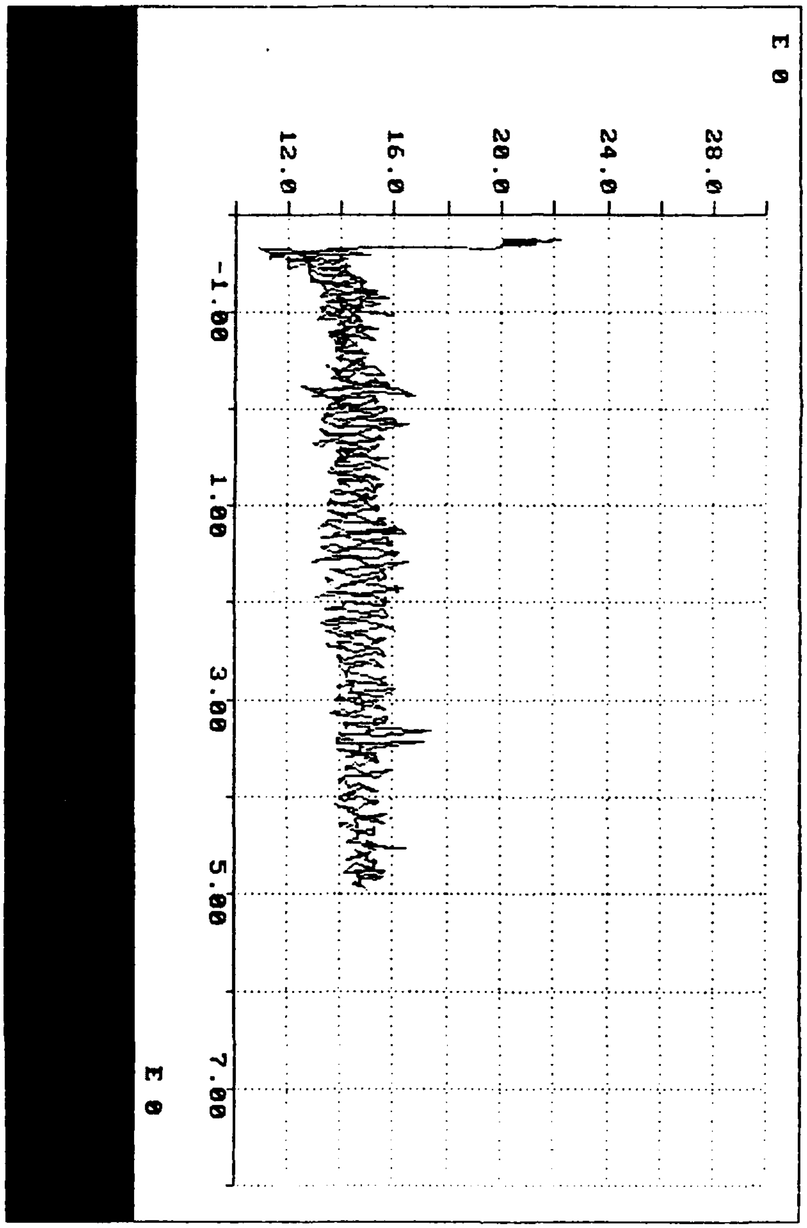
I/O Variable (R ...): 768 REAL

Subfile: < 1   2 × 256 (Max Length: 512)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
:                                                                                         :
:    File Name: <C:SEF14H.USR>                         Quit/Continue: *             :
:                                                                                         :
:    8 Comments                                          Subfile   Total #: 2          :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
: 1> INDIA INK SET=80 TC MAX=65                  : Start#       Shape          #Reps :
: 2> SLIGHT DESSICATION                                  1          2 x 256             :
: 3> NO CARBONIZATION                                                                    :
: 4> SLIGHT BLANCHING                                                                    :
: 5> NO SMOKE                                    :                                       :
: 6>                                             :                                       :
: 7> BD LEANED ON TABLE                          :                                       :
: 8> NO EVIDENCE OF A WELD                       :                                       :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
:  I/O Variable ( R - Z ):                                                               :
:                                                                                         :
:   Subfile:        < 1              2 x 256 (Max Length:  768 )                    :
:   Row (0=all):   < 0                                                                   :
:   Start Column: < 1 >                                                                  :
:   # of Columns: < 256 >                                                                :
:                                                                                         :
:   Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                      :
:                                                                                         :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
```



File Input/Output

File Name: <C:SEP14I.USR   Quit/Continue: *

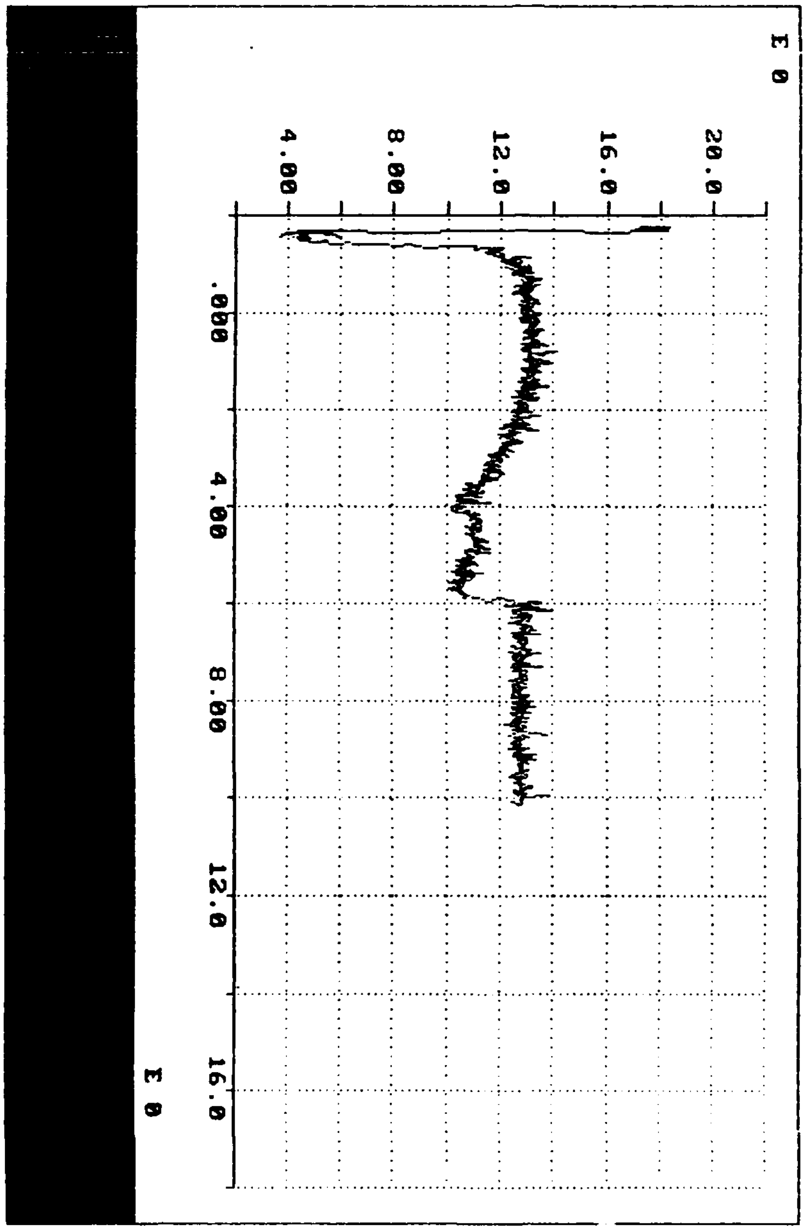
8 Comments   Subfiles (Total #: 4)

Comments	Start#	Shape	#Repts
1> INDIA INK SET=100, TC MAX=94			
2> TOTAL TIME=25S	1	2 x 256	4
3> DESSICATION AND BLANCHING			
4 NO SMOKE			
5			
6 STRONGEST AT THE SEROSAL SURFACE			
7 BEST WELD SO FAR TODAY			
8			

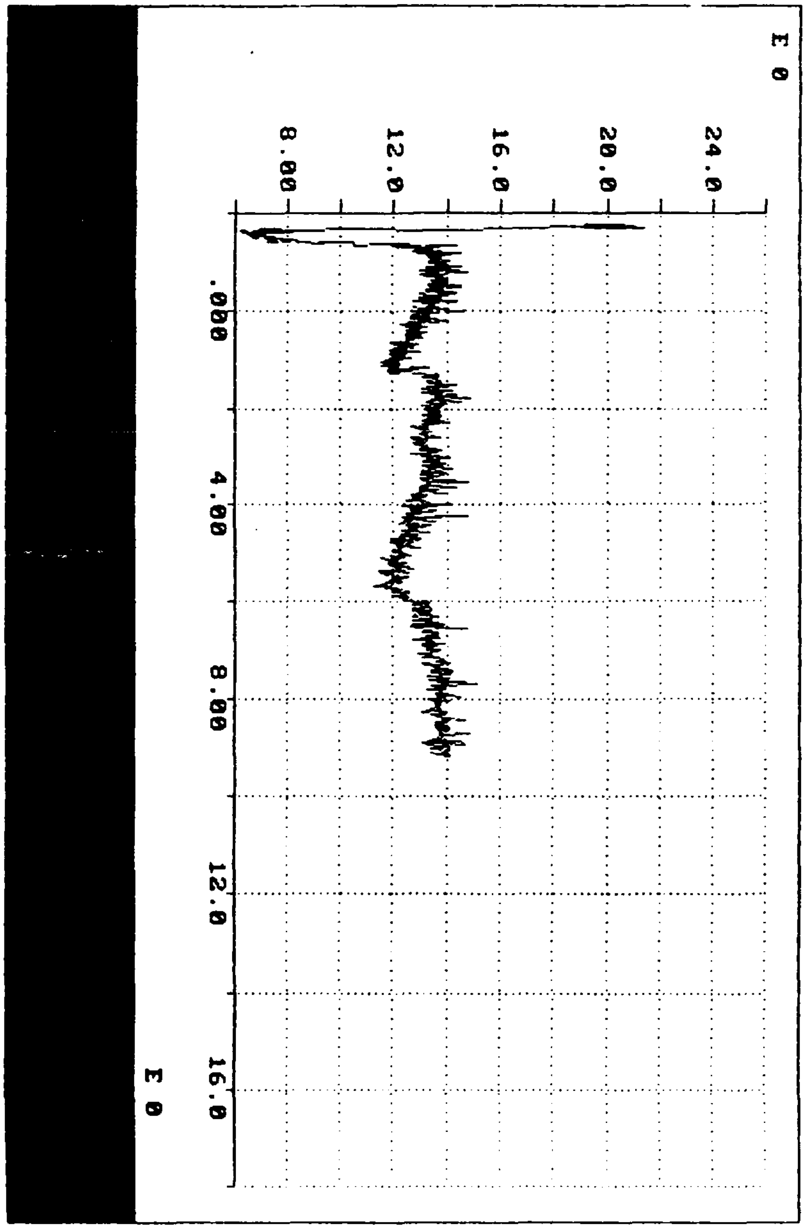
I/O Variable (R - 7):   76P REAL

Subfile: < 1   2 x 256 (Max Length: 1024)
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```
File Input/Output
:                                                                              :
:    File Name: C:SE[illegible]                     [illegible]                :
:                                                                              :
:    9 Comments                                     [illegible] Total #:       :
: 1  INDIA INK SET=100 [illegible]              : Start#     Shape     # pts   :
: 2  TIME = 35 S, 20 S AT 900 DEGREES           :    1       [illegible] 256   :
: 3  BLANCHING AND DE[illegible]                :                              :
: 4                                             :                              :
: 5  WEAK WELD PRESENT                          :                              :
: 6  APPEARS TO BE WEAKER THAN PREVIOUS         :                              :
: 7                                             :                              :
: 8                                             :                              :
:  I/O Variable ( R - Z ):                          1024 REAL                  :
:                                                                              :
:  Subfile:          1         2 x 256 (Max Length: 1024 )                     :
:  Row (0=all):      0                                                         :
:  Start Column:     1                                                         :
:  # of Columns:     256                                                       :
:                                                                              :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *                    :
:                                                                              :
```



File Input/Output

File Name: C:SE 145.DT   Quit/Continue: #

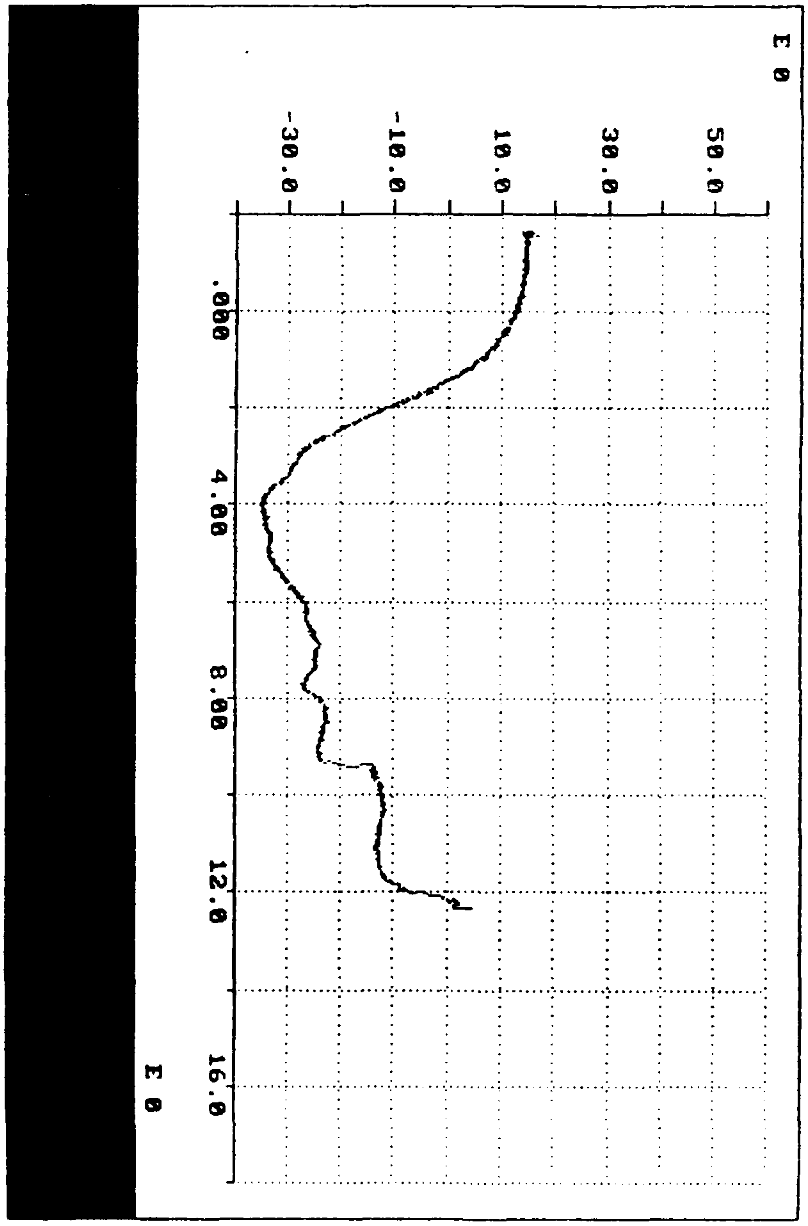
8 Comments   Subfiles (Total #: 5)

1 ONE STRIP CONTROL   Start   Stop   Points
2 SMALL APERTURE
3 BROKE BY THE CLAMP
4 (AT THE MOVING STAGE)
5
6
7
8

I/O Variable

Subfile:
Row (0=all): 0
Start Column: 1
\# of Columns: 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: Y



File Input/Output

File Name: <C:SEP141.JU> Quit/Continue: *

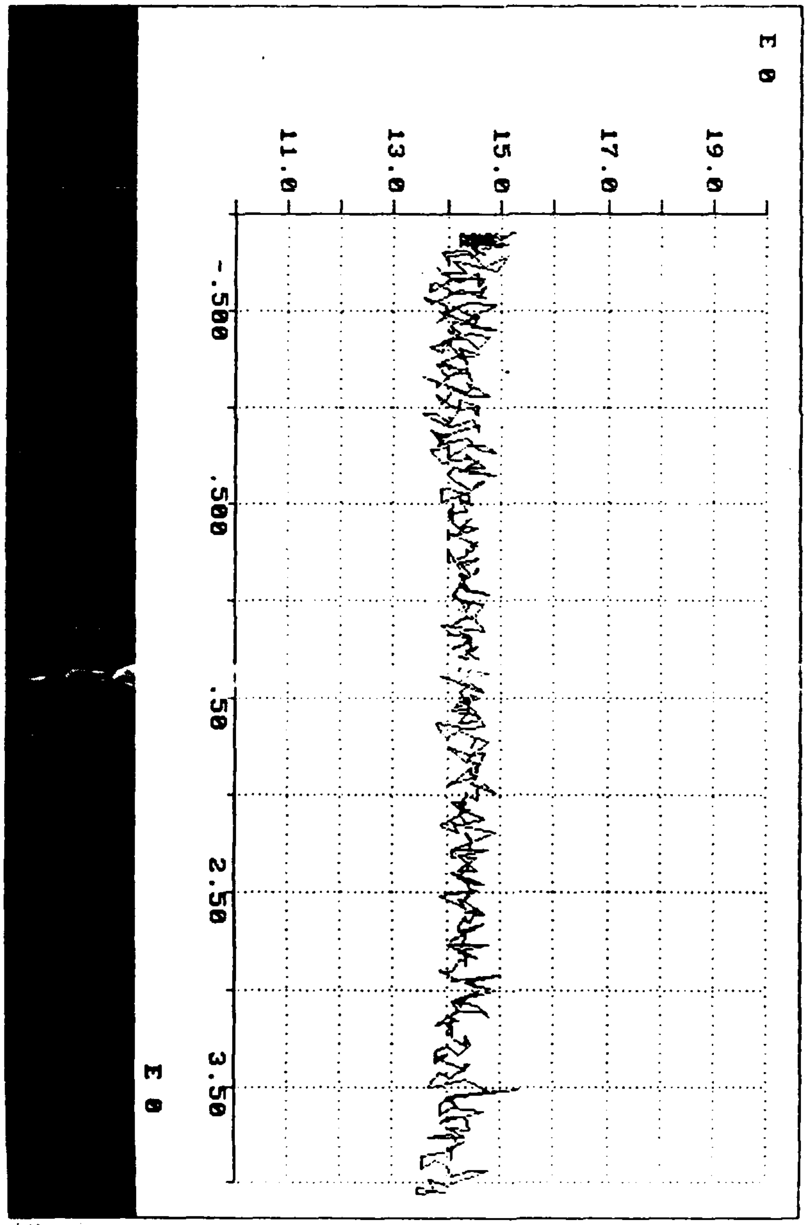
8 Comments Subfiles (Total #: 1)

1 TWO STRIP CONTROL UNWELDED	Start#	Shape	#Parts
2	1	2 × 256	1
3			
4			
5			
6			
7			
8			

I/O Variable (R = 2):

Subfile: 1 2 × 256 (Max Length: 50)
Row (0=all): 0
Start Column: 1
# of Columns: 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Name: [illegible]

8 Comments

1 TWO STRIP INDI[illegible]

2

3

4

5

6

7

8

I/O Variable (R - Z):

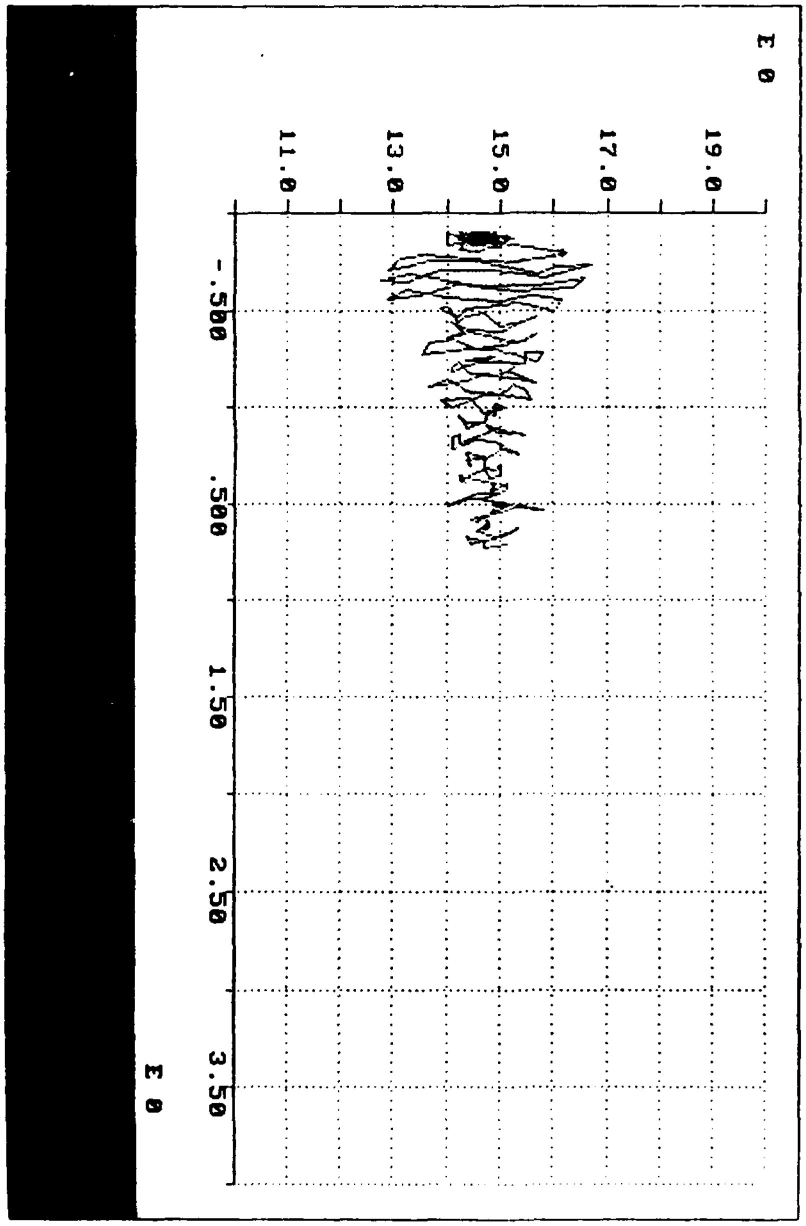
Subfile: 1

Row (0=all): 0

Start Column: 1

# of Columns: 256

Read/Write/Append/Scroll/Plot/Edit/List/New [illegible]



File Name: [illegible] Quit/[illegible]

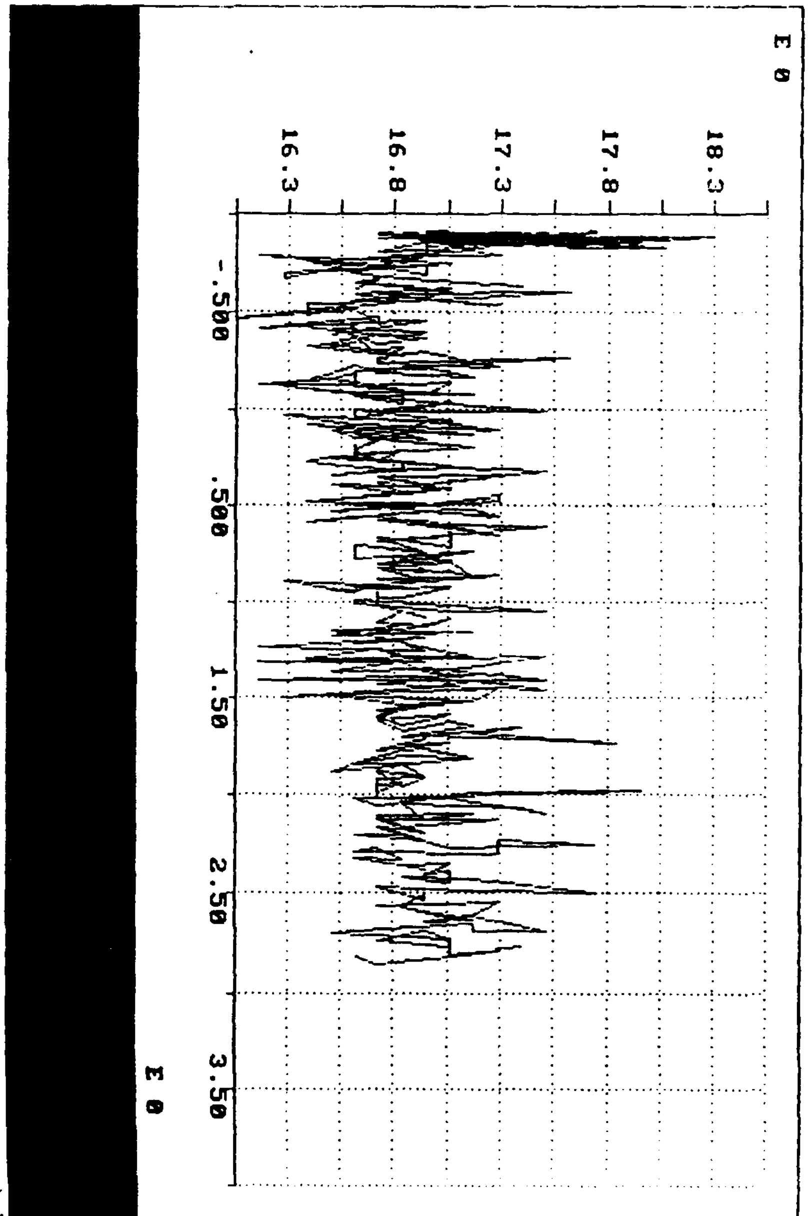
8 Comments Subfiles (Total #: [illegible])

1	INDIA INK CONTROLLED AT 50	Start# Shape [illegible]
2	SMALL APERTURE	1 2 x 256 [illegible]
3	NO VISUAL CHANGE	
4		
5	NO WELD SEEN	
6		
7		
8		

I/O Variable (R - 2) [illegible]

Subfile: < 1 > 2 x 256 (Max Length: [illegible])
Row (0=all): < 0 >
Start Column: < 1 >
# of Columns: < 256 >

Read/Write/Append/Scroll/[illegible]/Edit/List/New/[illegible]/Quit: ?



File Input/Output

File Name: <C:SEP14.JJ08R   Quit/Continue : ?

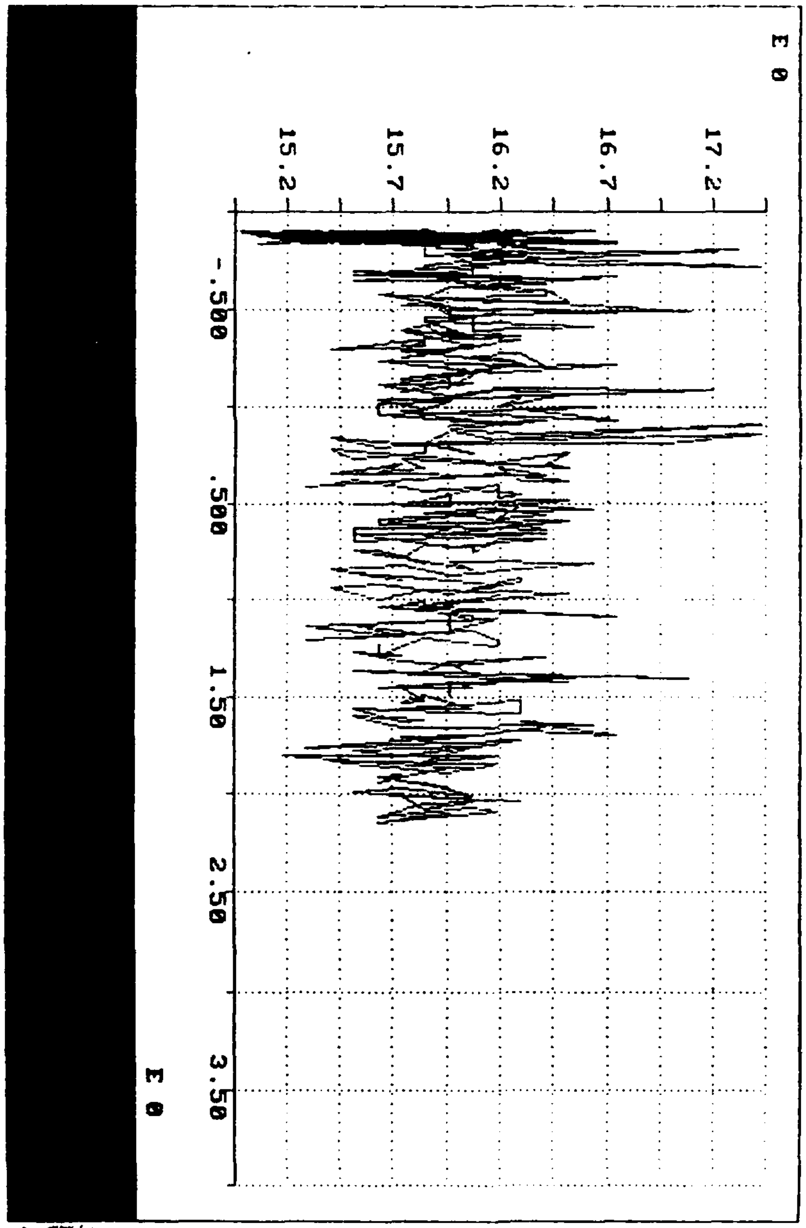
8 Comments   Subfiles (Total #: 2)

1 INDIA INK CONTROLLED AT 60	Start#	Chans	#Points
2 SLIGHT SMOKING	1	2	256
3 SLIGHT BLANCHING			
4 NO DESSICATION			
5			
6 WEAK WELD			
7 TORE AT SEROSA			
8			

I/O Variable (F - Z):   512 REAL

Subfile: 1   2 x 256 (Max Length: 512)
Row (0=all): < 0 >
Start Column: < 1
# of Columns: < 256

Read/Write/Append/Scroll/Int/Edit/List/New/Quit: ?



: File Name: C:SEM...

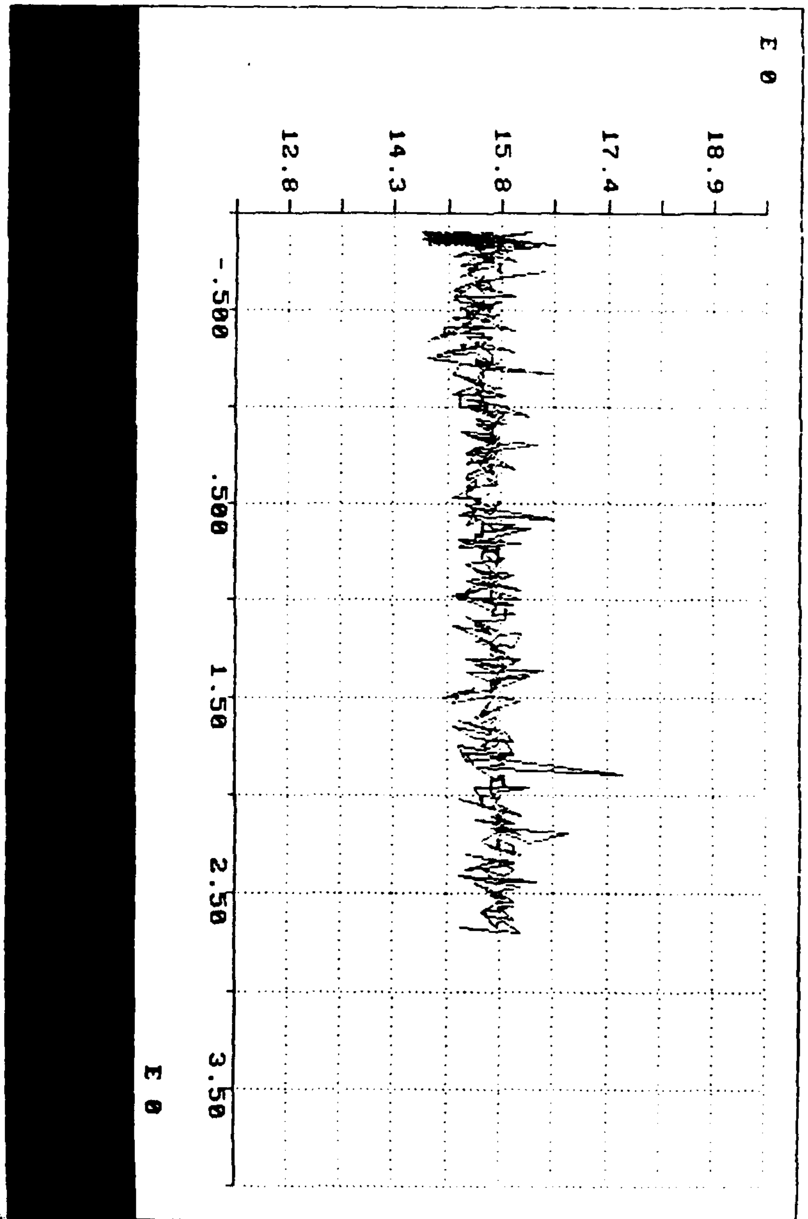
: 8 Comments

: 1 INDIA INK CONTR...
: 2 SMALL APER...
: BLANCHING ...
: NO SMOKE
: 6 DID NOT ...
: 8

: I/O Variable

: Subfile: 1 ... Length:
: Row (0=all): 0
: Start Column: 1
: # of Columns: 256

: Read/Write/Append/...



File Input/Output

File Name: C:SPF14

8 Comments

1 INDIA INK CONTR
2 SMALL APERTURE
3 LARCHING
4 NO SMOKE
5
6 MEDIUM WELD

I/O Variable (R):

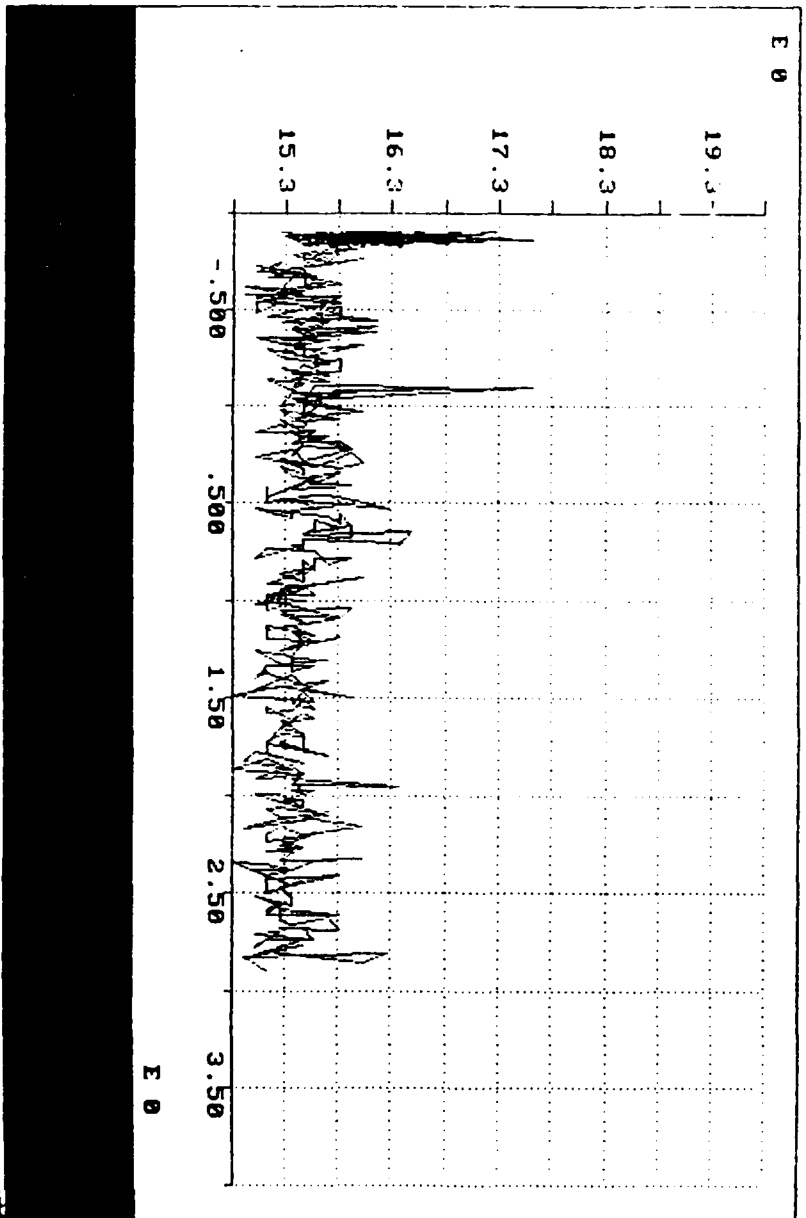
Subfile: 1

Row (0=all): 0

Start Column: 1

\# of Columns: 256

Read/Write/Append



File Name: Cal

8 Comments

1 INDIA INF CONT

2 SMALL APERTURE

3 SCANNING AND

4 SMOKE

I/O Variable (

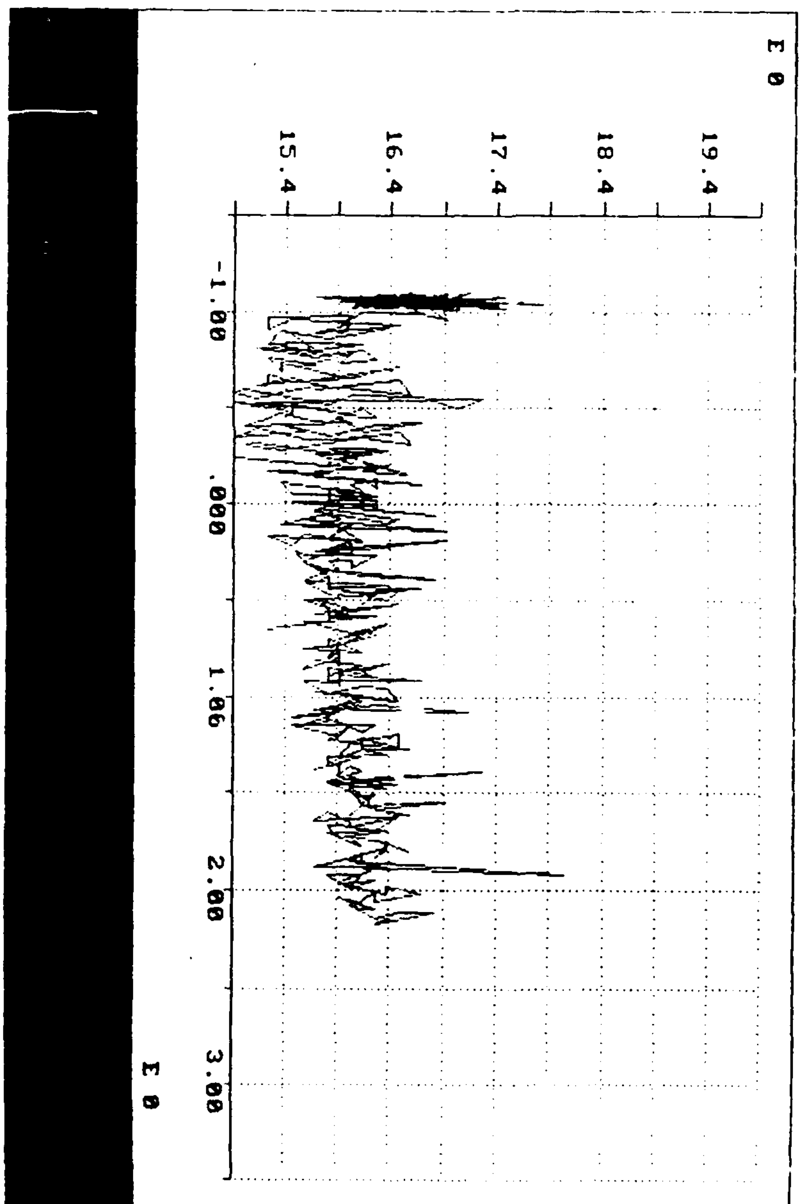
Prefile:

Row (0=all):

Start Column:

# of Columns:

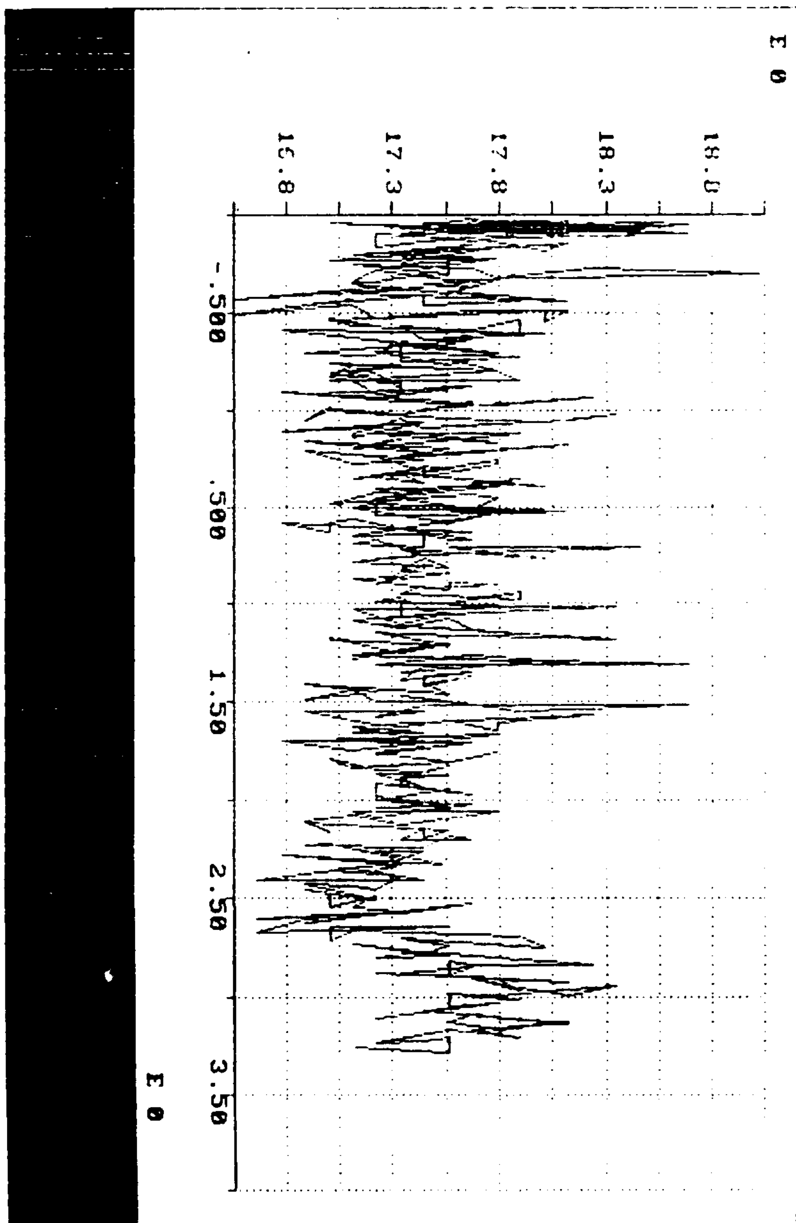
Read/Write/Append



File Name:

Comments

WELL



File Name: [illegible]

I/O Variable [illegible]

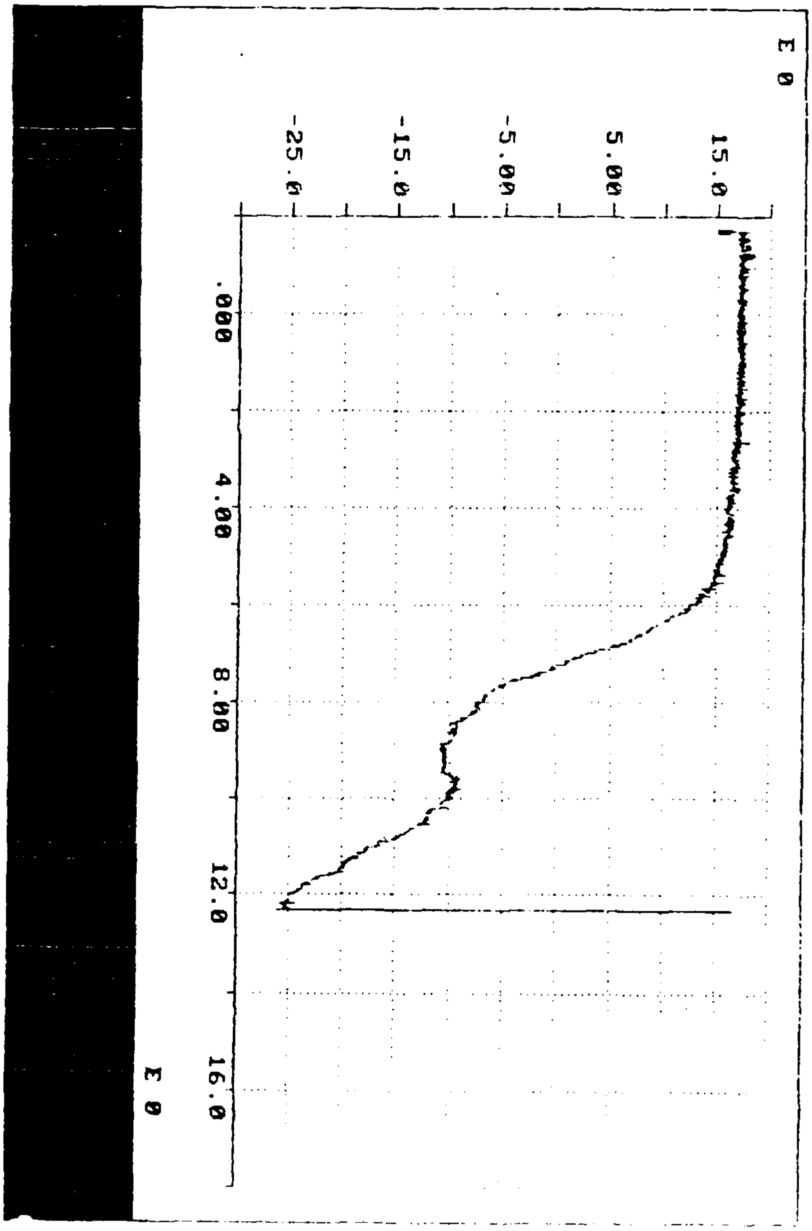
Subfile:

Row (0=all):

Start Column:

\# of Columns:

Read/Write Append [illegible]



File Name: C:SEM...

Comments

1 TWO STRIP UNWEL...

I/O Variable

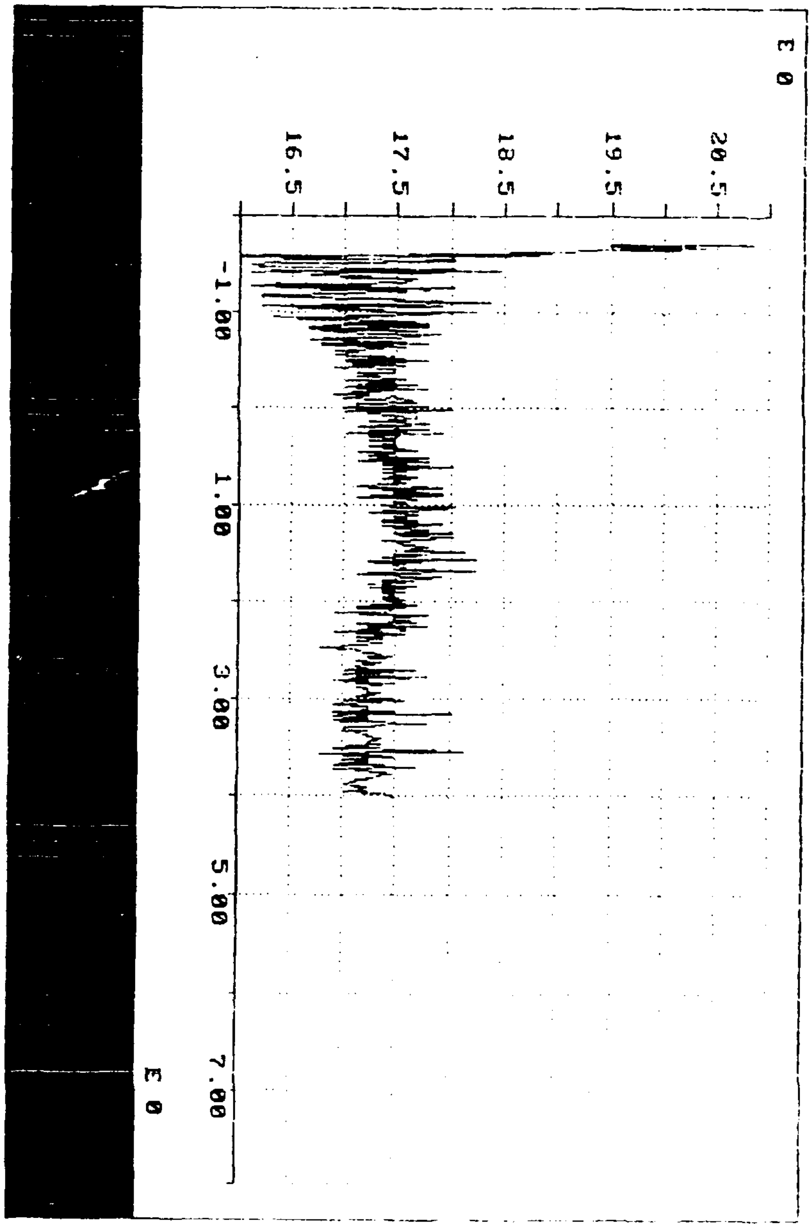
Subfile: 1

Row (0=all): 0

Start Column: 1

\# of Columns: 256

Read/Write/Append...



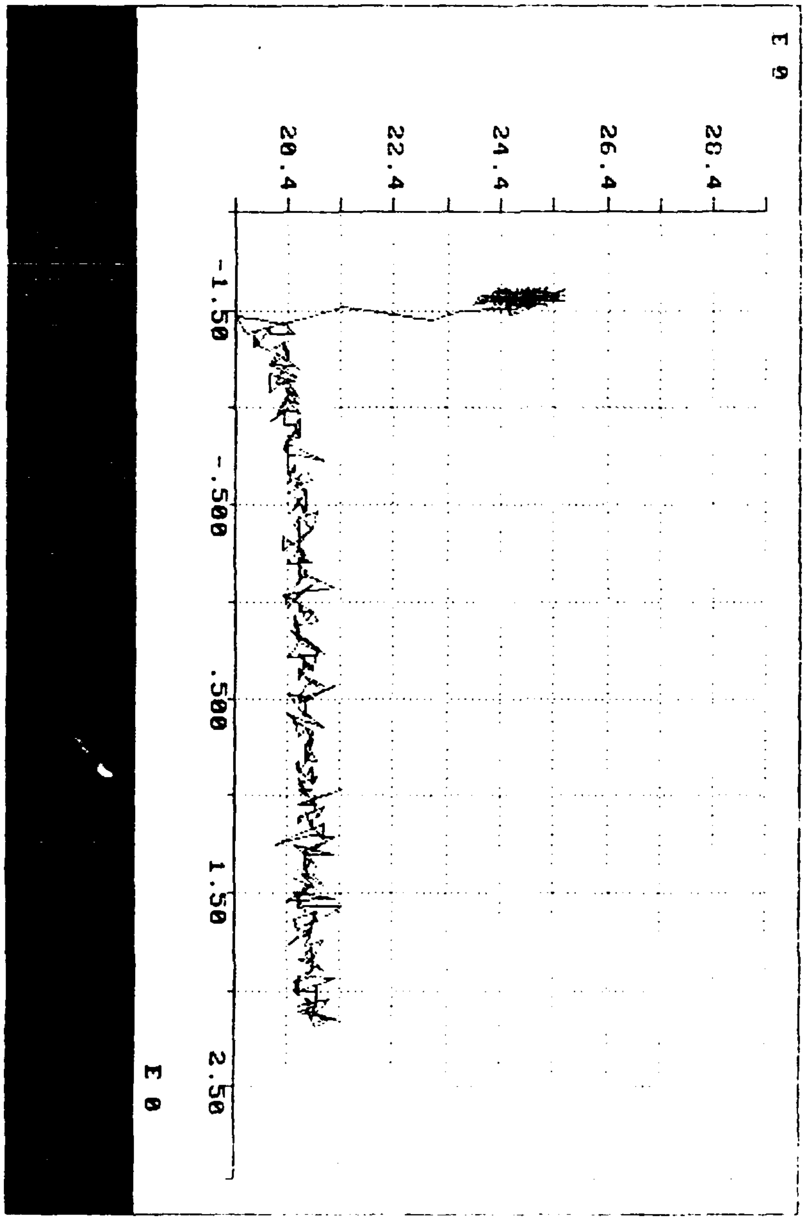
File Name:

Comments

I/O Variable (

Row (cell):
Start Column:
# of Columns:

Read/Write/Append/



File Name: [illegible]

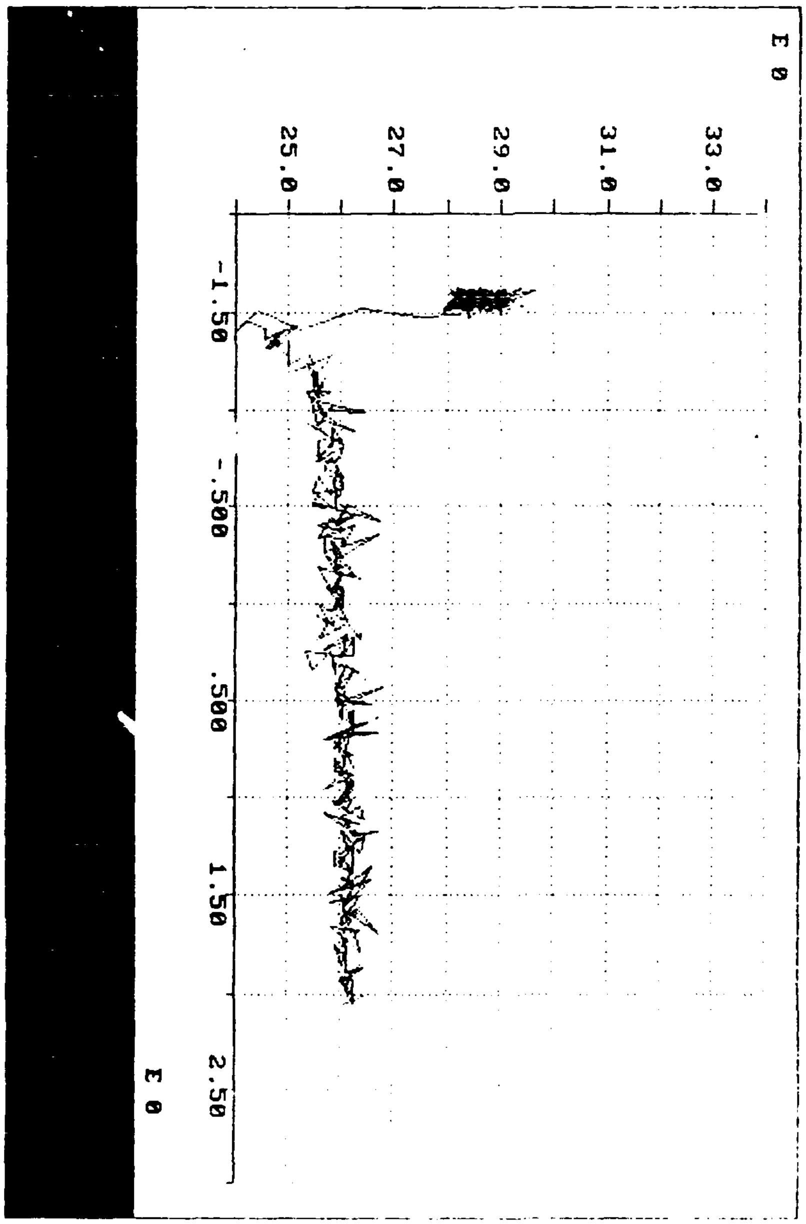
9 Comments

1 2X IGG CONTROLLED AT [illegible]
2 NO VISIBLE CHANGE
3 NO SMOKE

I/O Variable

Subfile: 1
Row (0=all): 0
Start Column: 1
# of Columns: 256

Read/Write/Append/



File Name: [illegible]

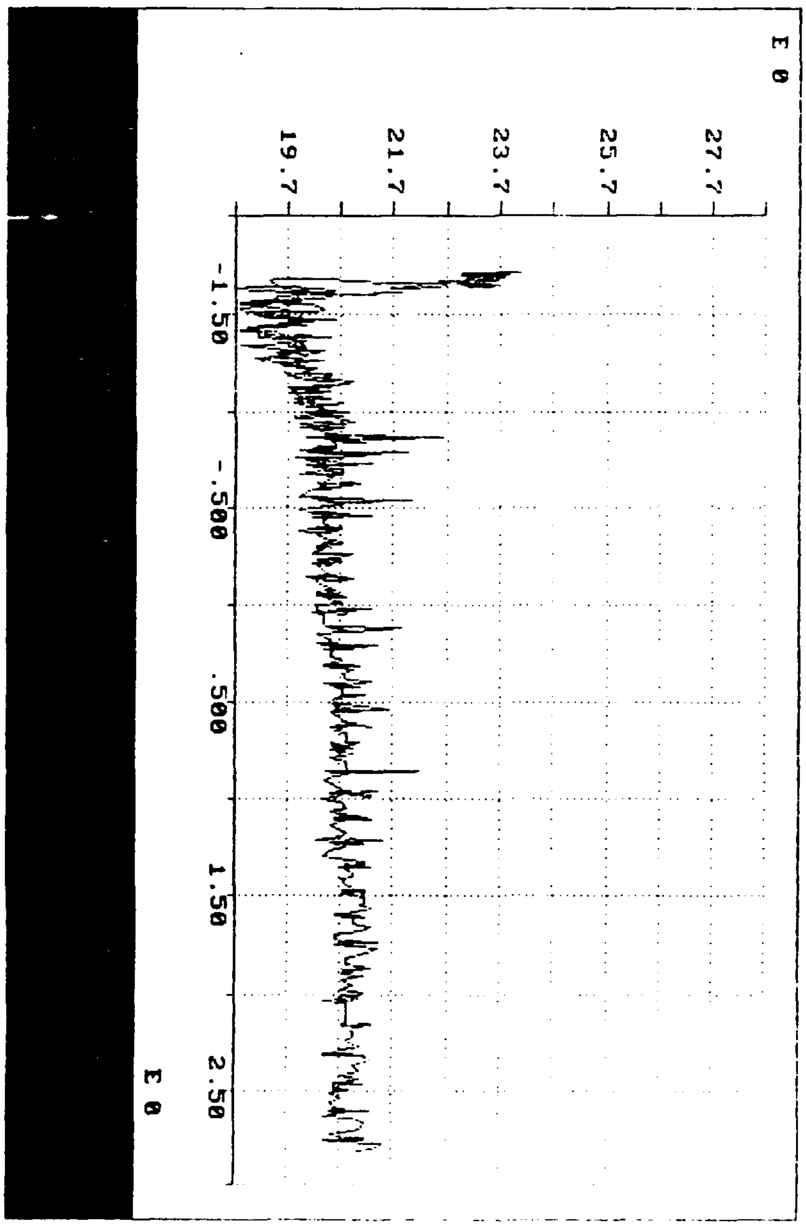
9 Comments

1 FERRONYL+BLOOD CONTROLLED AT [illegible]
2 MINIMAL BLANCHING [illegible]
3 NO SMOKE
4 LESS CHROMOPHORE [illegible]
5
6 WELDED, BUT NO [illegible]
7 ONLY SEROSA [illegible]

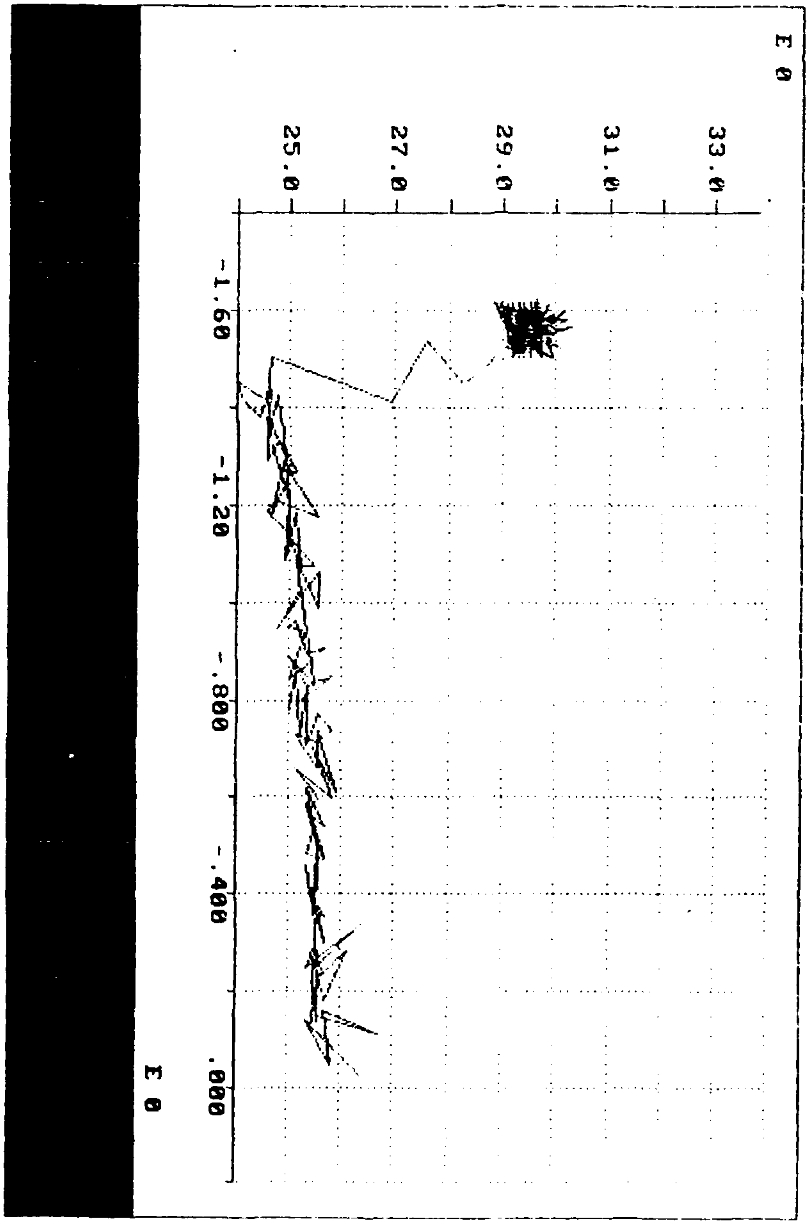
I/O Variable [illegible]

Subfile:
Row (0=all): 0
Start Column: 1
# of Columns: 256

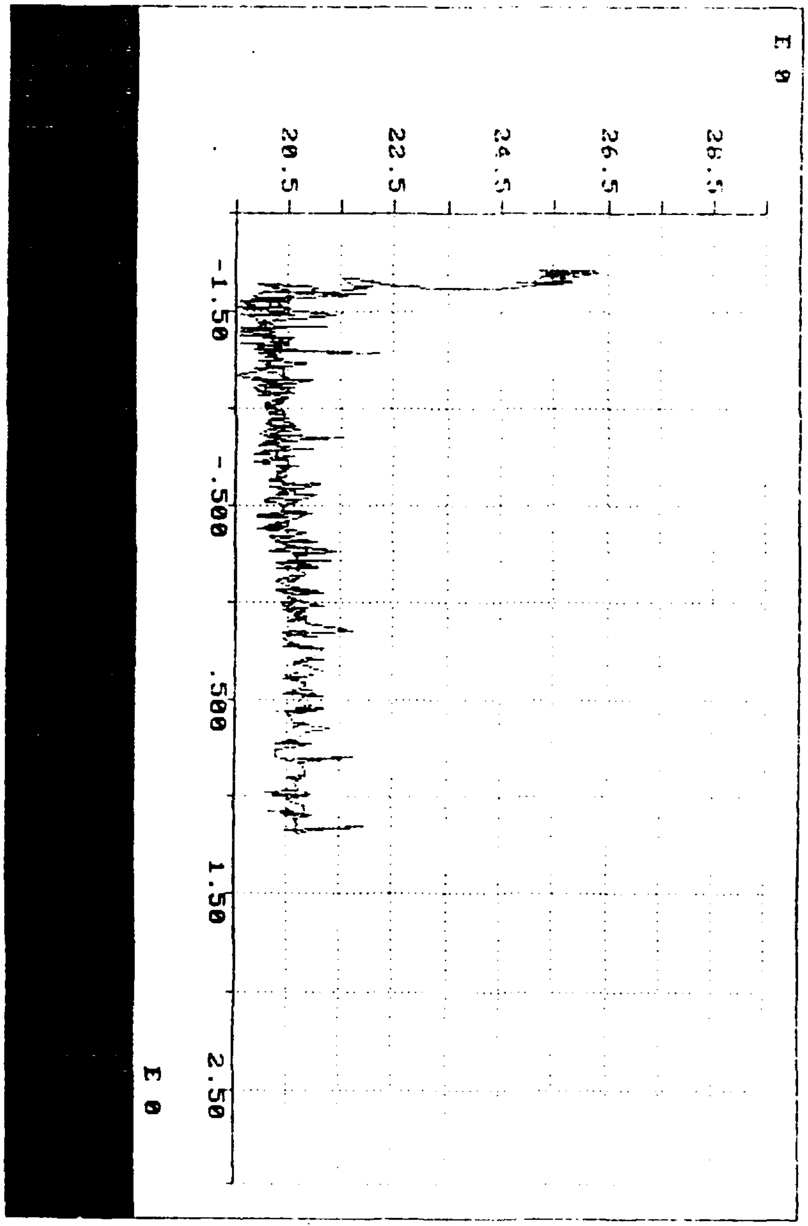
Read/Write/Append/Scroll/Plot/Edit/List/Help/Quit: [illegible]



```
:
:    File Name:
:
:    9 Comments
:
:  I/O Variable (  -  ):
:
:  Subfile:        1
:  Row (0=all):
:  Start Column:
:  # of Columns:
:
:  Read/Write/Append
:
```



: Start Column: 1
: # of Columns:
:
: Read/Write/Append/

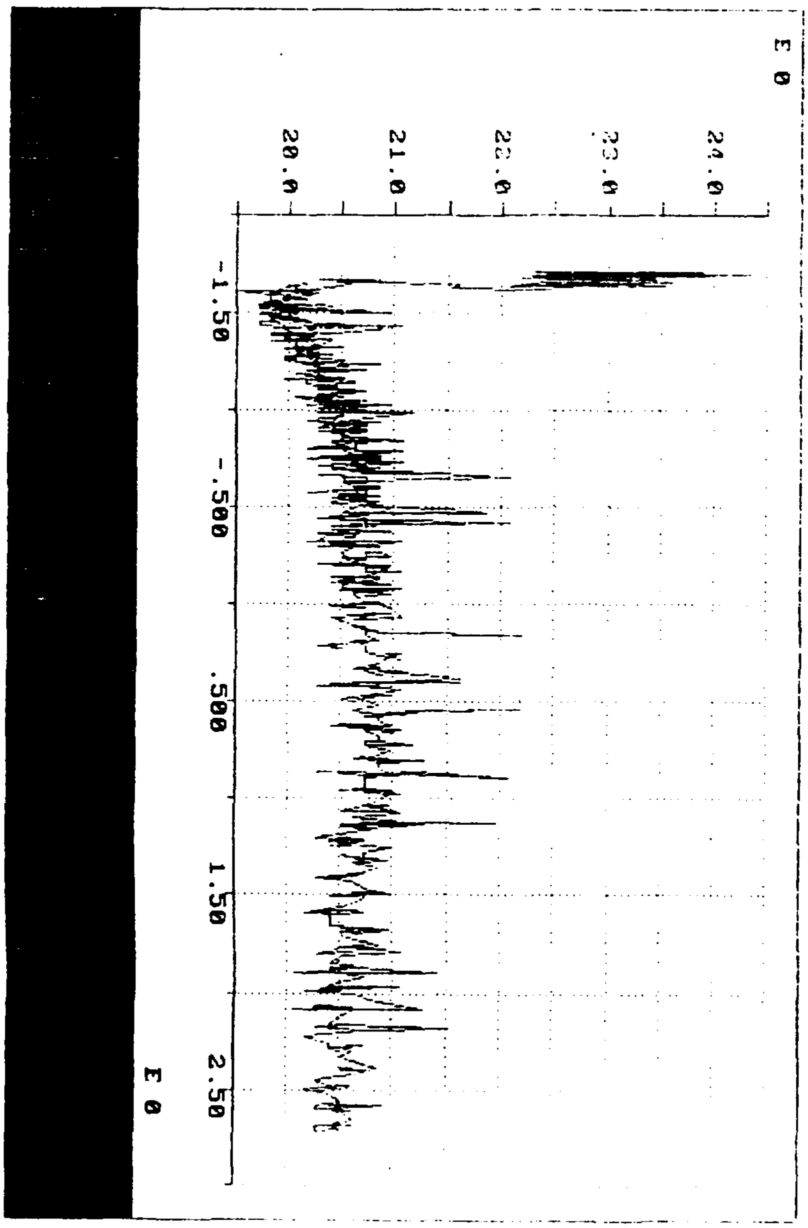


Name:

Subfile:

Start Column

# of Columns:



File Name: C:\S...

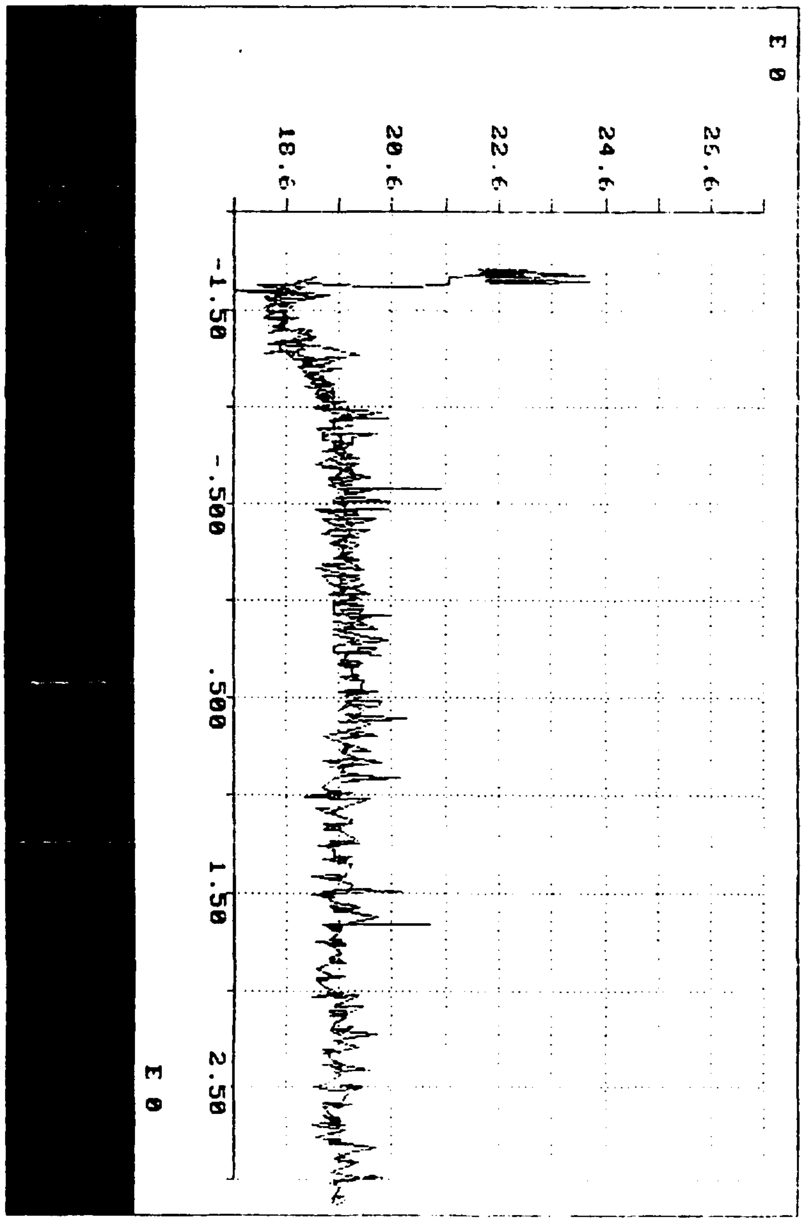
9 Comments

1 BLOOD ALONE ...
2 NO VISIBLE CHANG...
3 NO SMOKE
4
5 NO WELD
6
7
8

I/O Variable

Subfile:
Row (0=all):
Start Column: 1
\# of Columns: 2...

Read/Write/Append/Scroll/Plot/Edit ...



Name: [illegible]

Comments

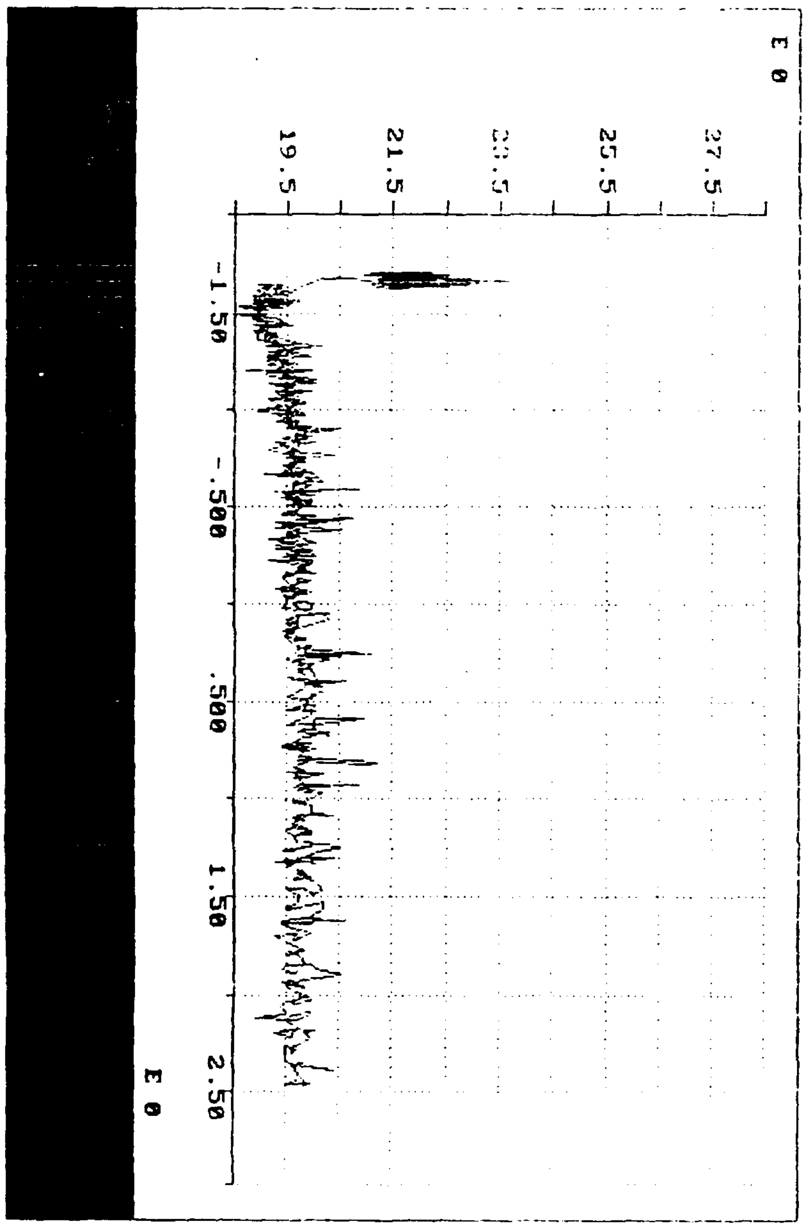
1 BLOOD ALONE [illegible]
2 BARELY PERCEPTIBLE [illegible]
3 NO SMOKE
4 [illegible]SICATION

6 [illegible] WELD
7 [illegible]

Variable [illegible]

Subfile: [illegible]
Row (0=all): [illegible]
Start Column: 1
# of Columns: 256

Read/Write/Append [illegible]



File Name:

Comments

1 FLOOD ALONG

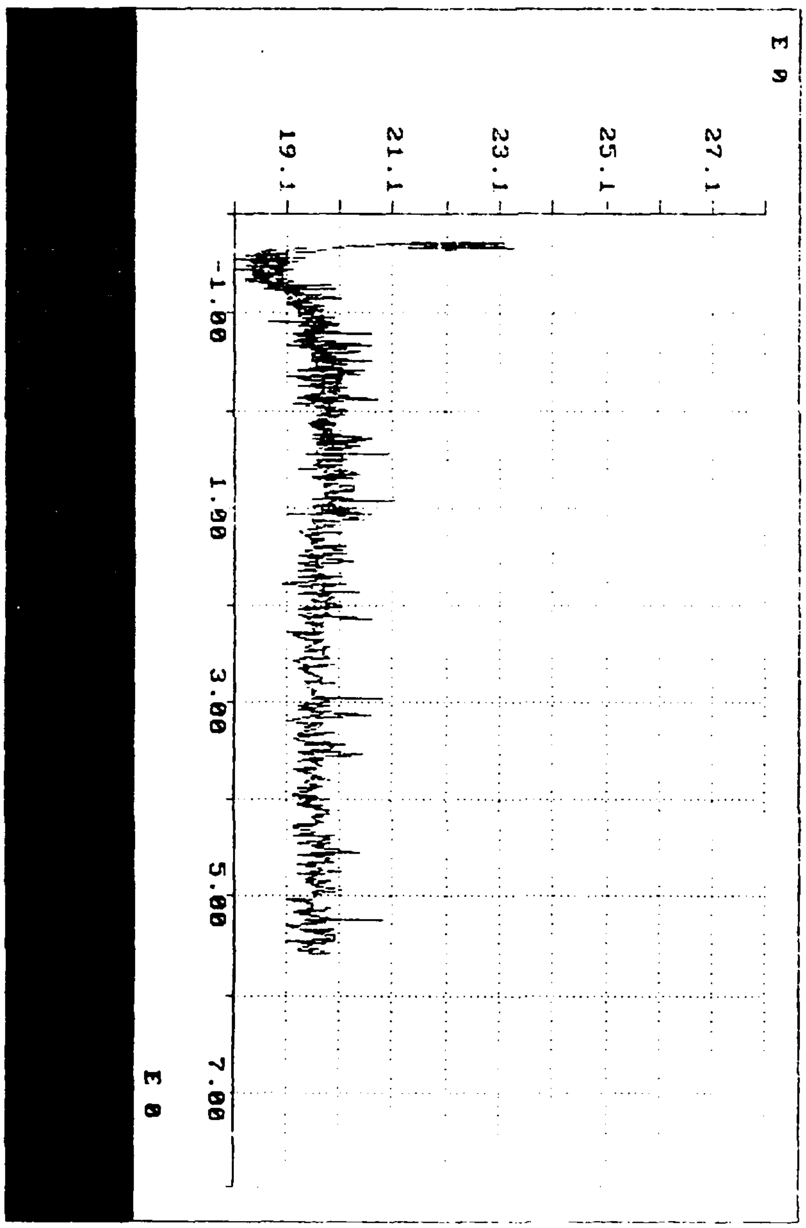
2 TOTAL EXPOSURE

4 NO DESSICATION

NO SMOKE

7 NO WELD

# of Columns:

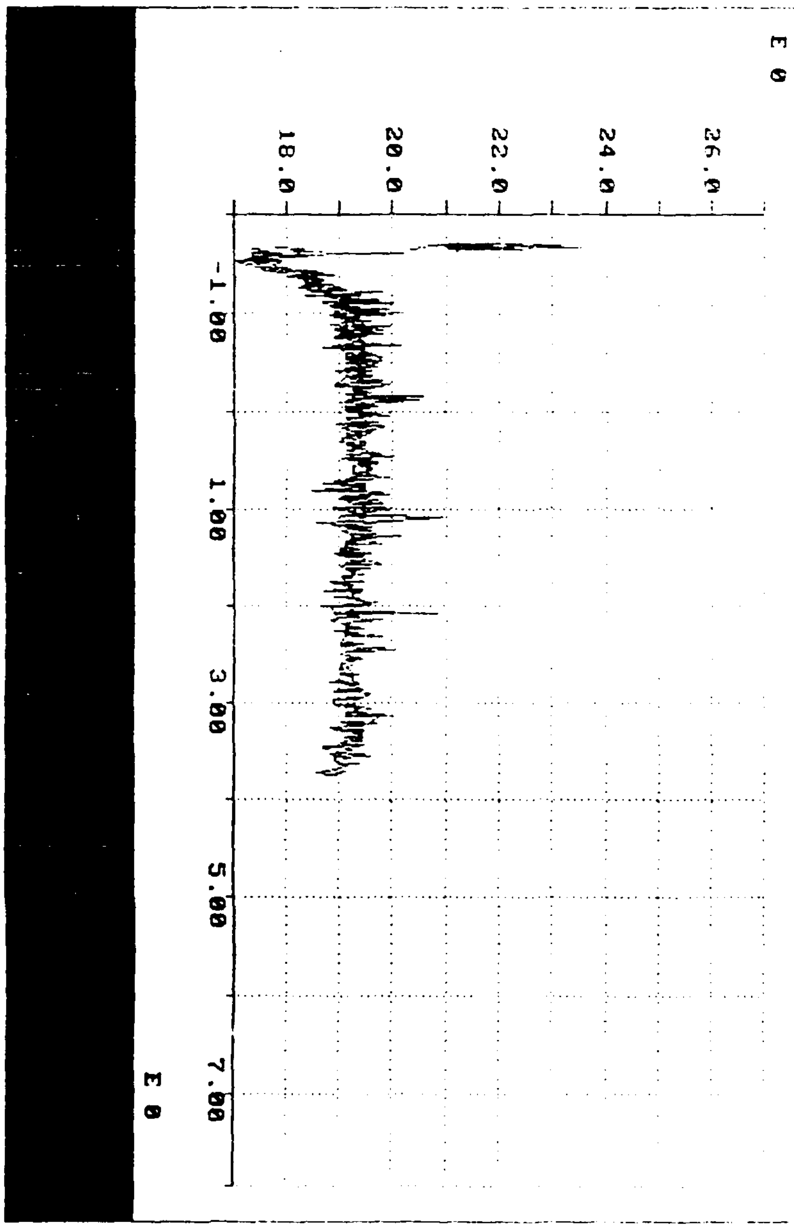


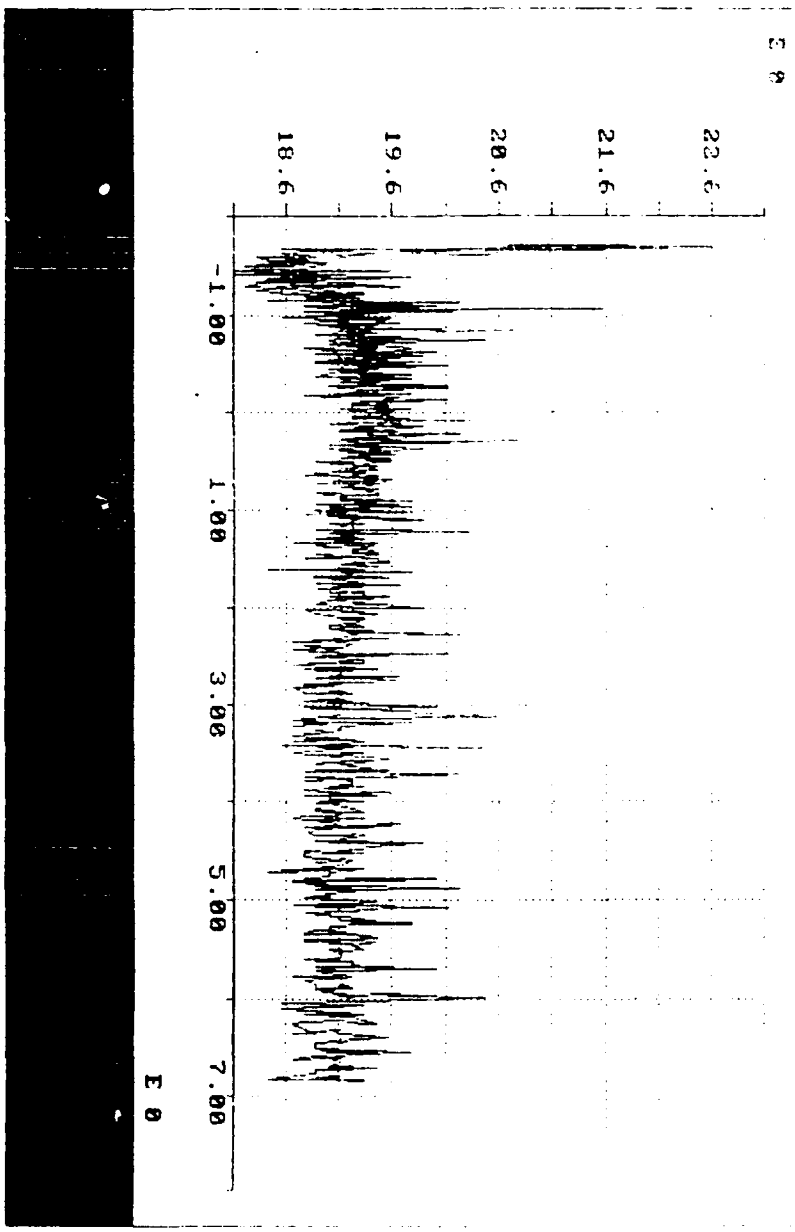
File Name: [illegible]

8 Comments

1 BLOOD ALONE [illegible]

Subfile: 1
Row (0=all): [illegible]
Start Column: [illegible]
# of Columns: [illegible]

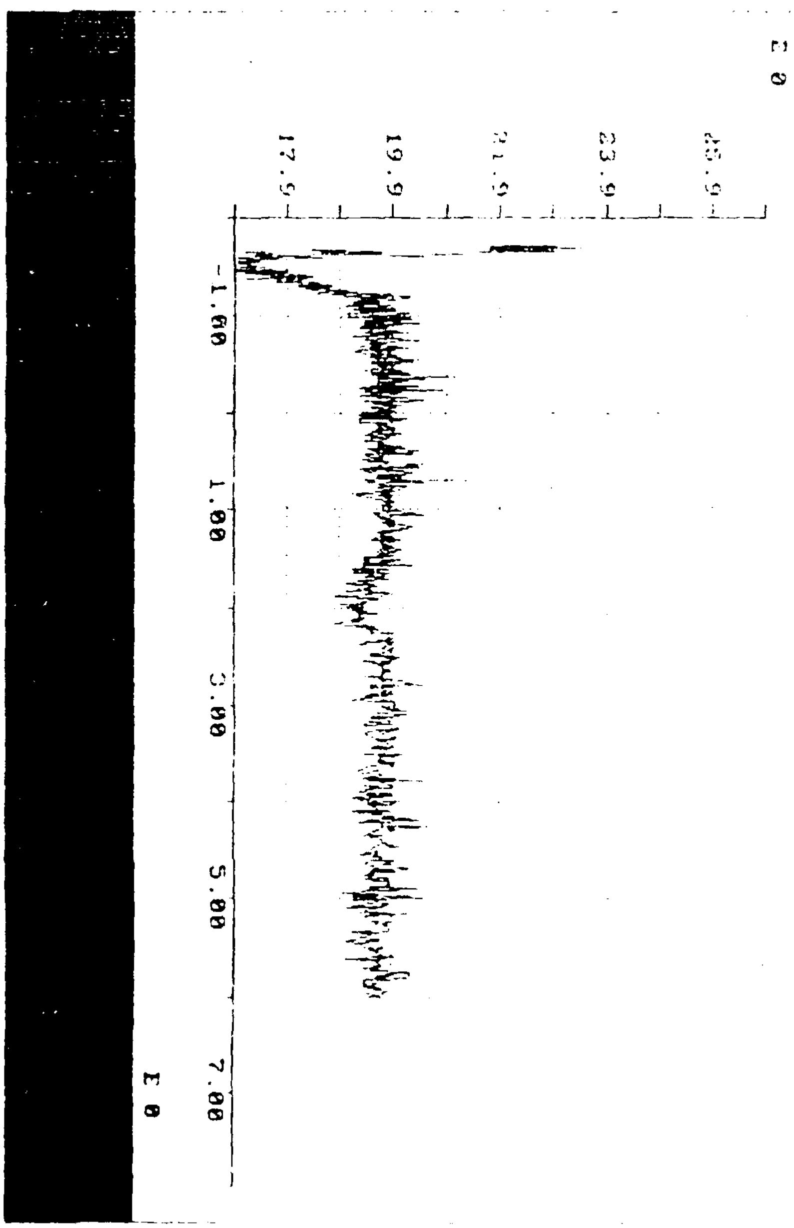


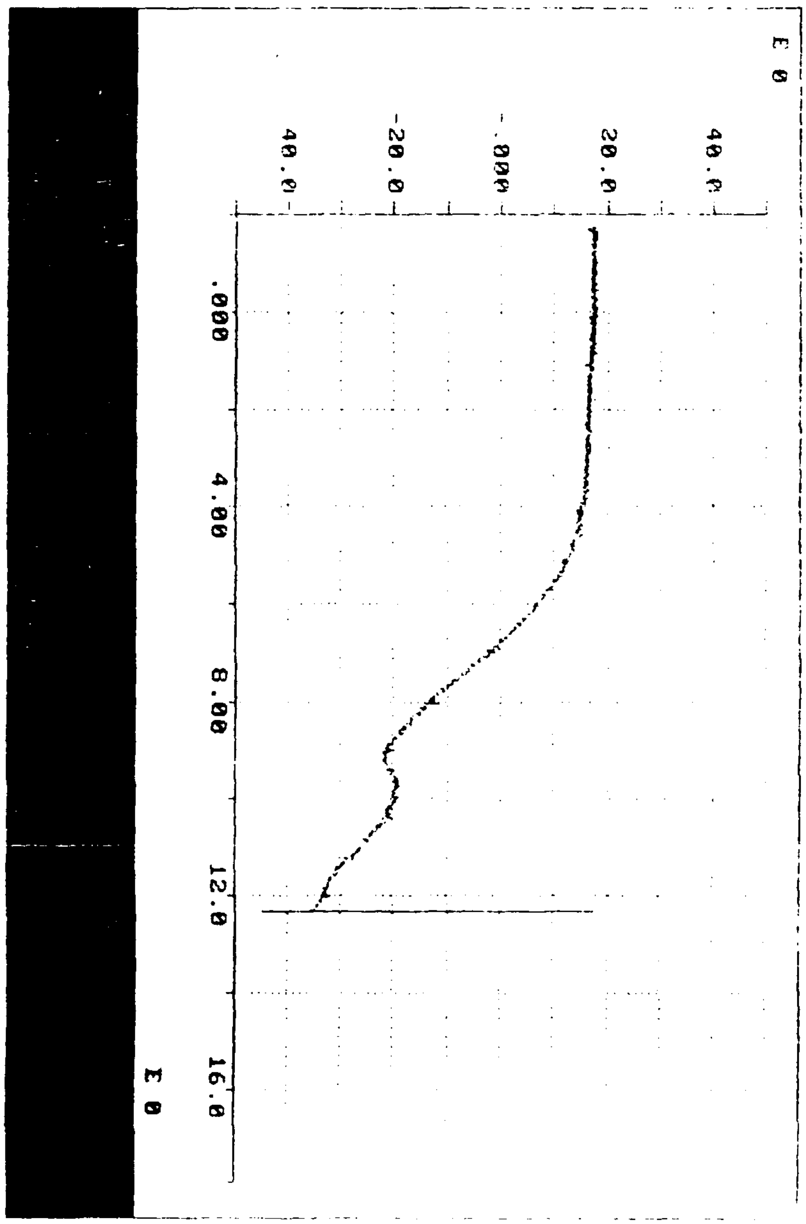


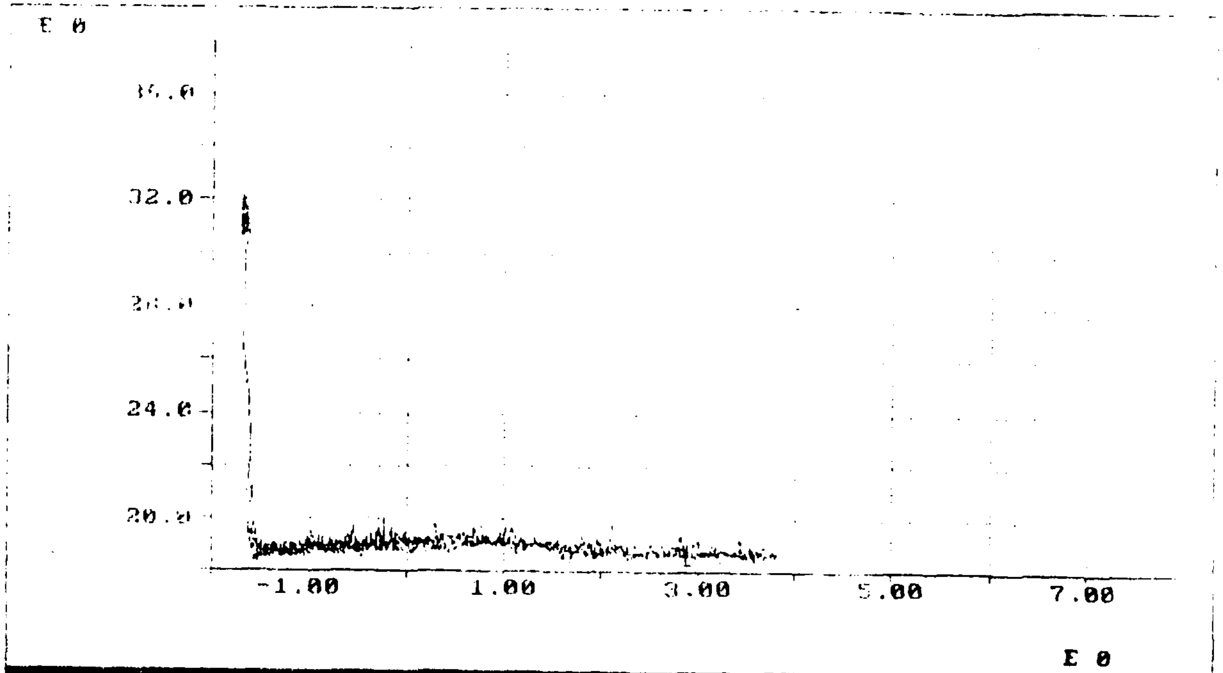
18.6
19.6
20.6
21.6
22.6
E 0
-1.00
1.00
3.00
5.00
7.00
E 0

Comments

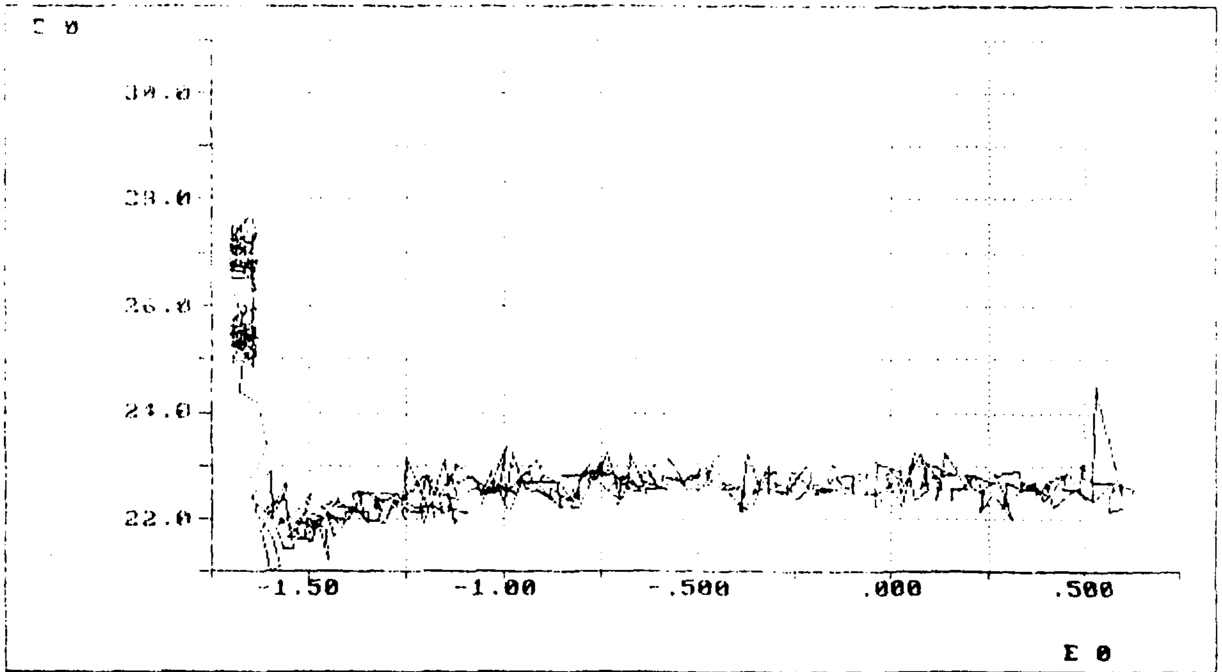
BLOOD



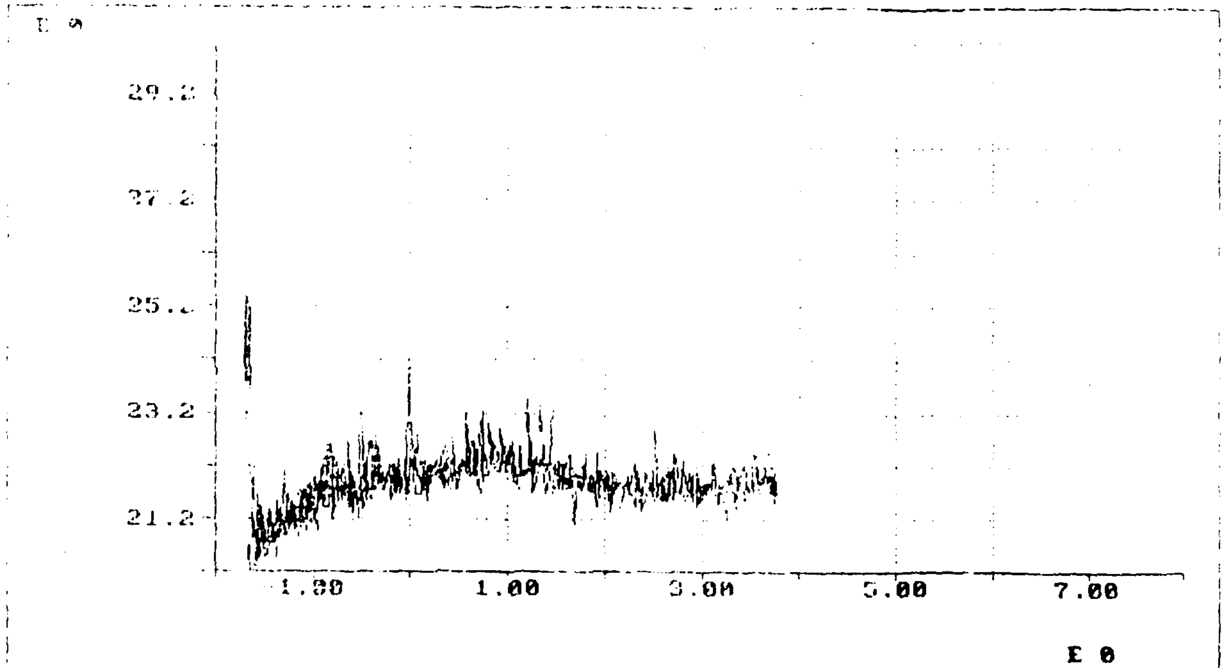

E 0
40.0
20.0
.000
-20.0
40.0
.000
4.00
8.00
12.0
16.0
E 0



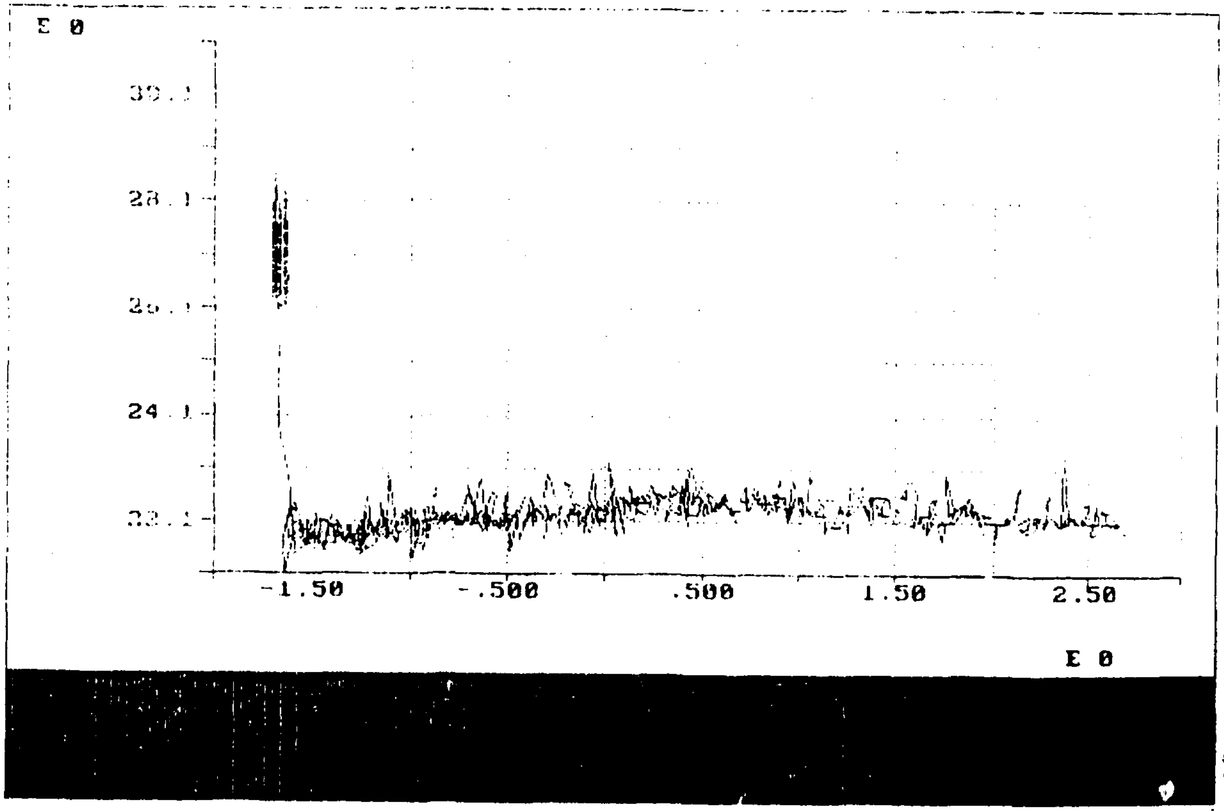
E 0
32.0
24.0
20.0
-1.00
1.00
3.00
5.00
7.00
E 0



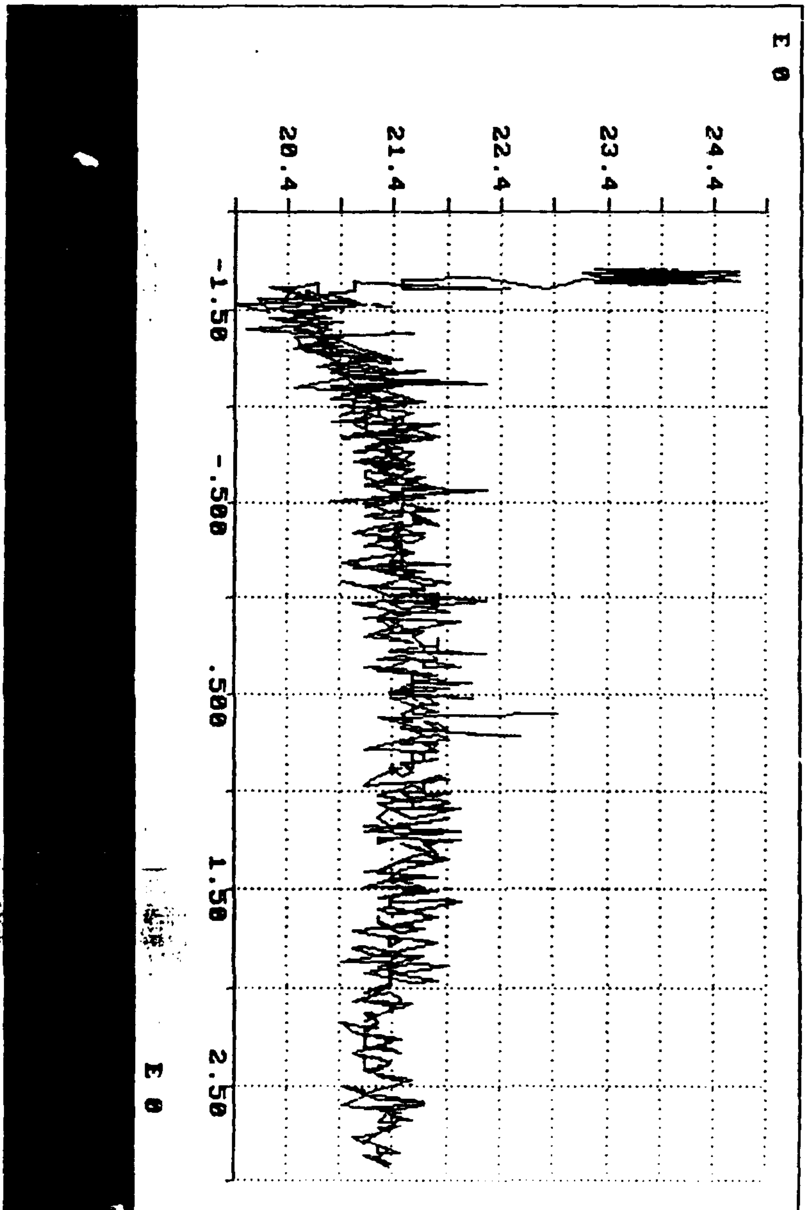
30.0
28.0
26.0
24.0
22.0
-1.50
-1.00
-.500
.000
.500
E 0



29.2
27.2
25.2
23.2
21.2
1.00
1.00
3.00
5.00
7.00
E 0


E 0
24.
-1.50
-.500
.500
1.50
2.50
E 0

```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM File Input/Output MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:                                                                                    :
:   File Name: <C:SEP18AE.USR>                      Quit/Continue: *          :
:                                                                                    :
:   8 Comments                                         Subfiles  (Total #: 3 )     :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMKMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
: 1> BLOOD SET=80 TC MAX=40                     : Start#      Shape       #Repts :
: 2> TOTAL EXPOSURE =30 S                       :    1        2 x 256        3    :
: 3> NO VISIBLE CHANGES                         :                                 :
: 4> NO SMOKE                                   :                                 :
: 5>                                            :                                 :
: 6> NO WELD                                    :                                 :
: 7>                                            :                                 :
: 8>                                            :                                 :
LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMJMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9
:  I/O Variable ( R - Z ):                          1024 REAL             :
:                                                                                    :
:  Subfile:      < 1 >          2 x 256 (Max Length:  768 )              :
:  Row (0=all):  < 0 >                                                       :
:  Start Column: < 1 >                                                       :
:  # of Columns: < 256 >                                                     :
:                                                                                    :
:  Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *              :
:                                                                                    :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```



3 Comments

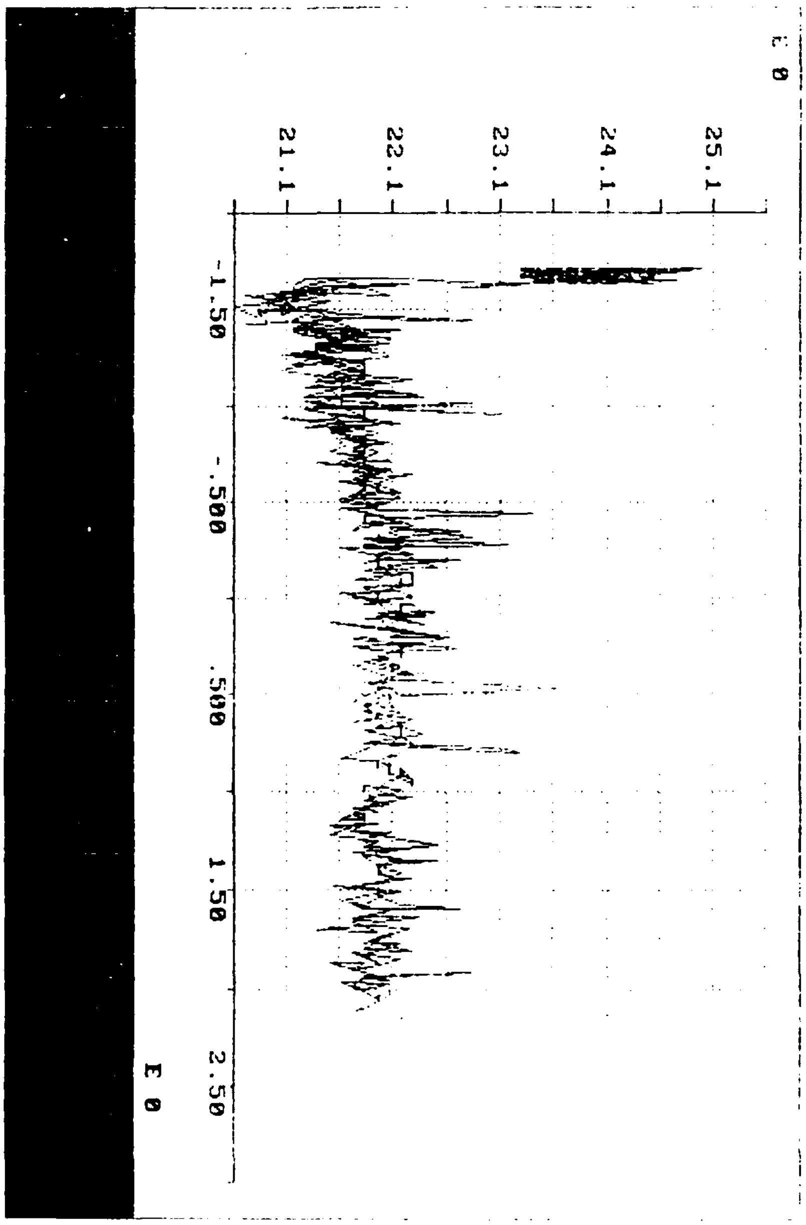
1: BLOOD SET=10

2: NO VISIBLE

Set file:

Start Column:

of Columns:



File Name:

Comments

1 ONE STRIP UNWEL

2 BROKE AT THE

Variable

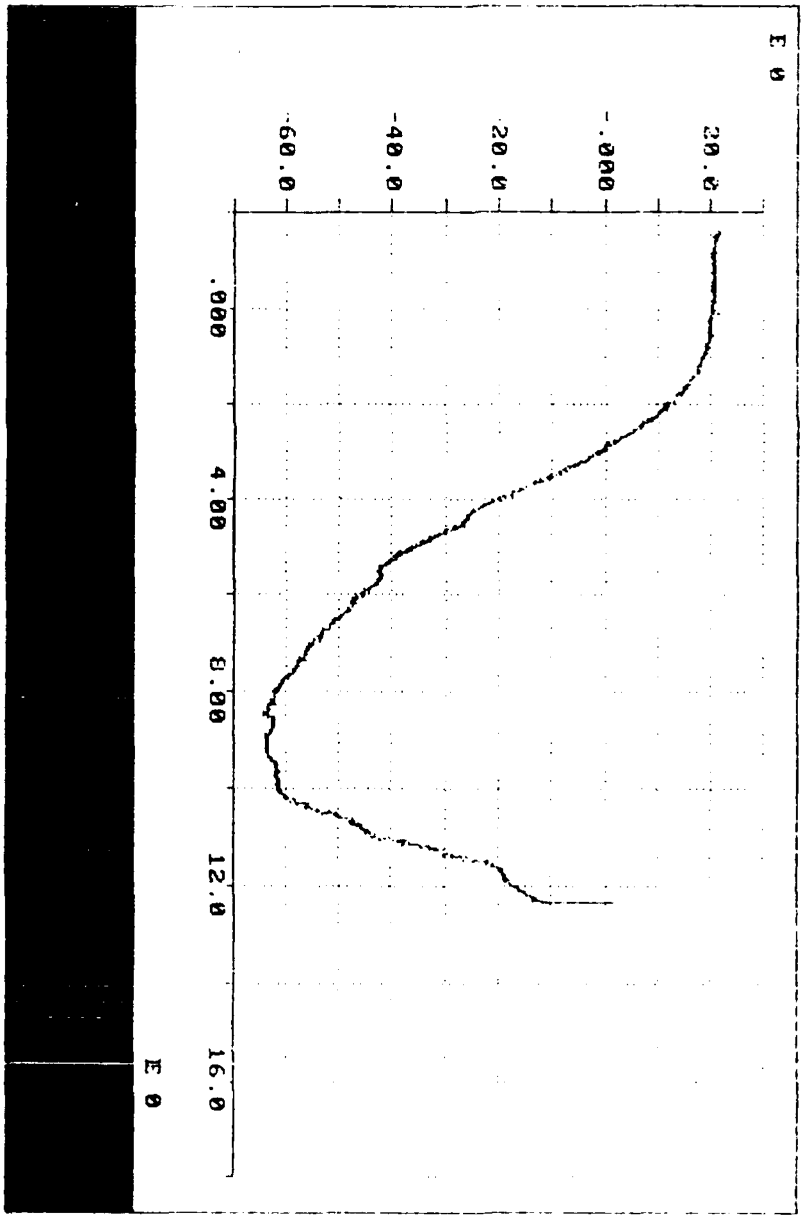
Subfile:

Row (Detail):

Start Column: 1

# of Columns: 25

Read/Write/Append/Scroll



File Name: C:3E

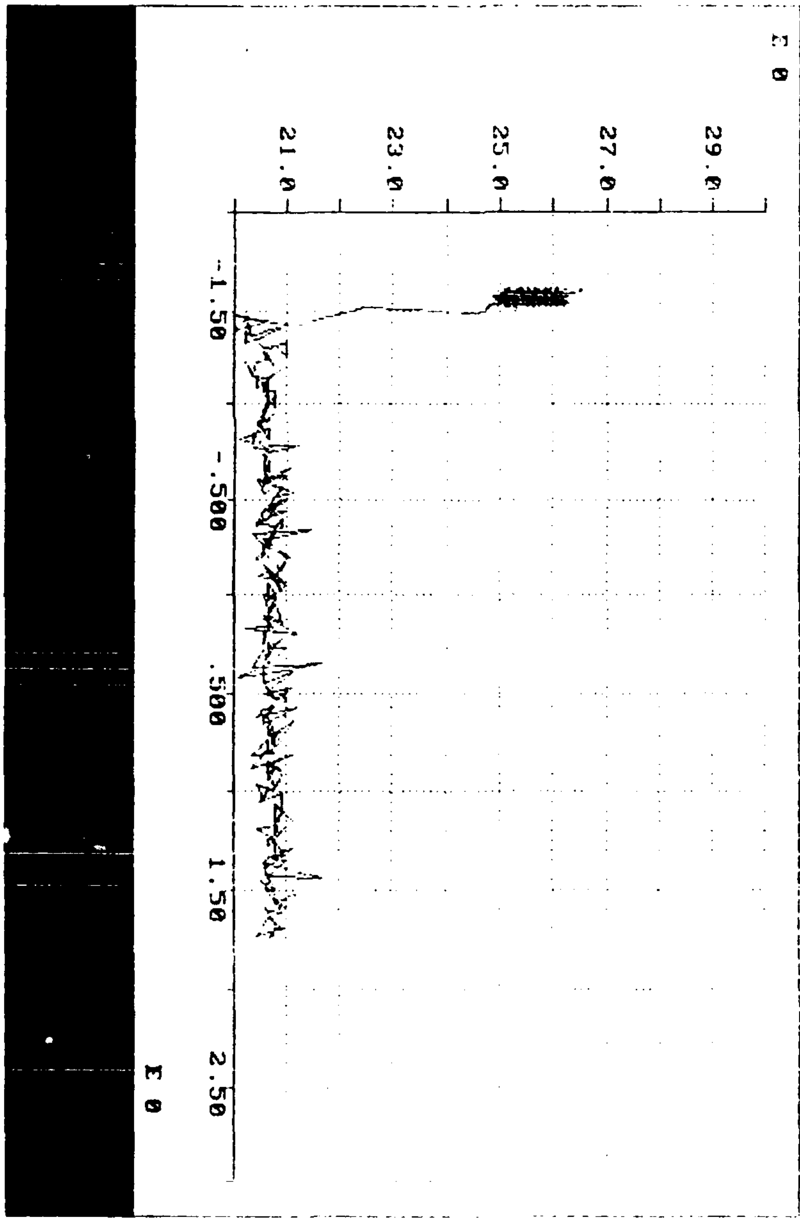
Comments

1 TWO

I/O Variable

Subfile: 1
Row (or all):
Start Column: 1
# of Columns: 2

Read/Write/Append



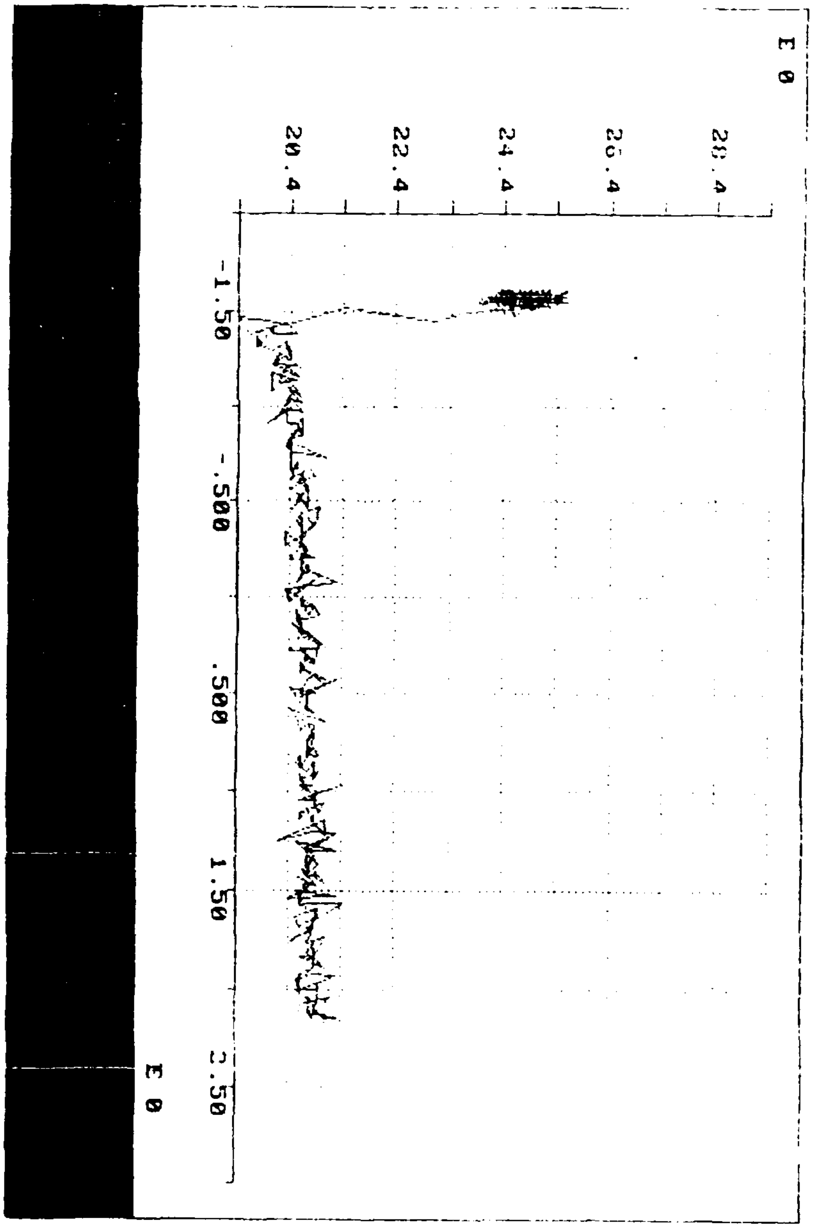
File Name:

Comments:

I/O Variable

Subfile:
Row (0=all):
Start Column: 1
# of Columns: 256

Read/Write/Append/Scroll/Plot/Exit



File Name:

B Comments

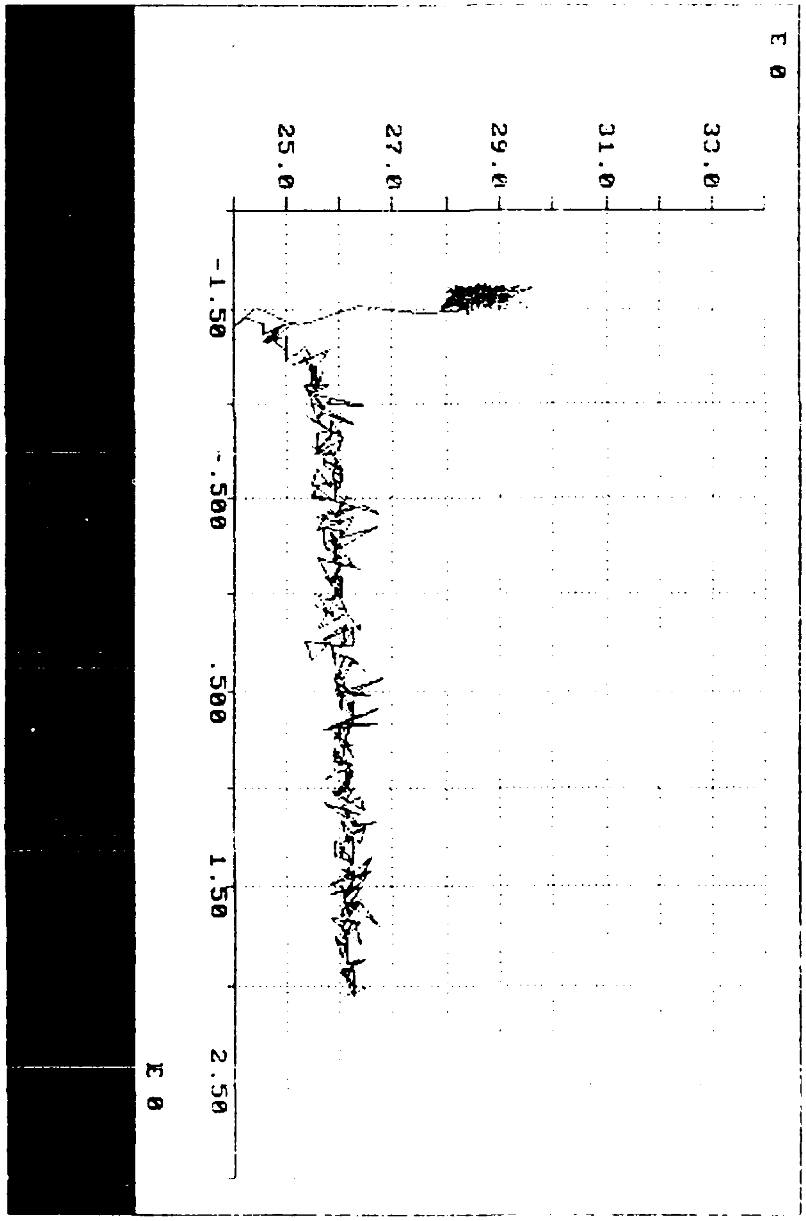
24 ICB CONT
VISIBLE
SMOKE

N WELL

I/O Variable

Subfile:
(Small):
Start Column
Columns:

Read/Write/Append



File name:

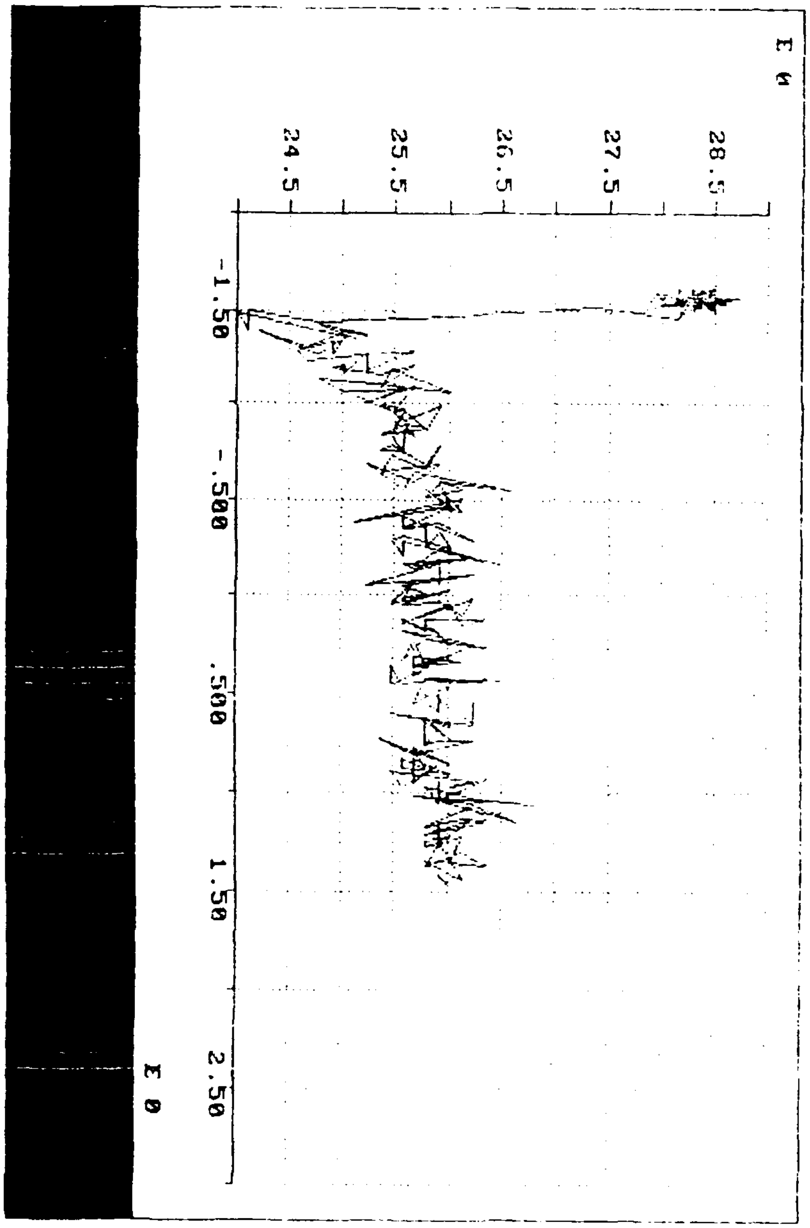
Comments

2 NO VISIBLE CHANGE

Variable

Subfile:
Row (0=all):
Start Column:
# of Columns:

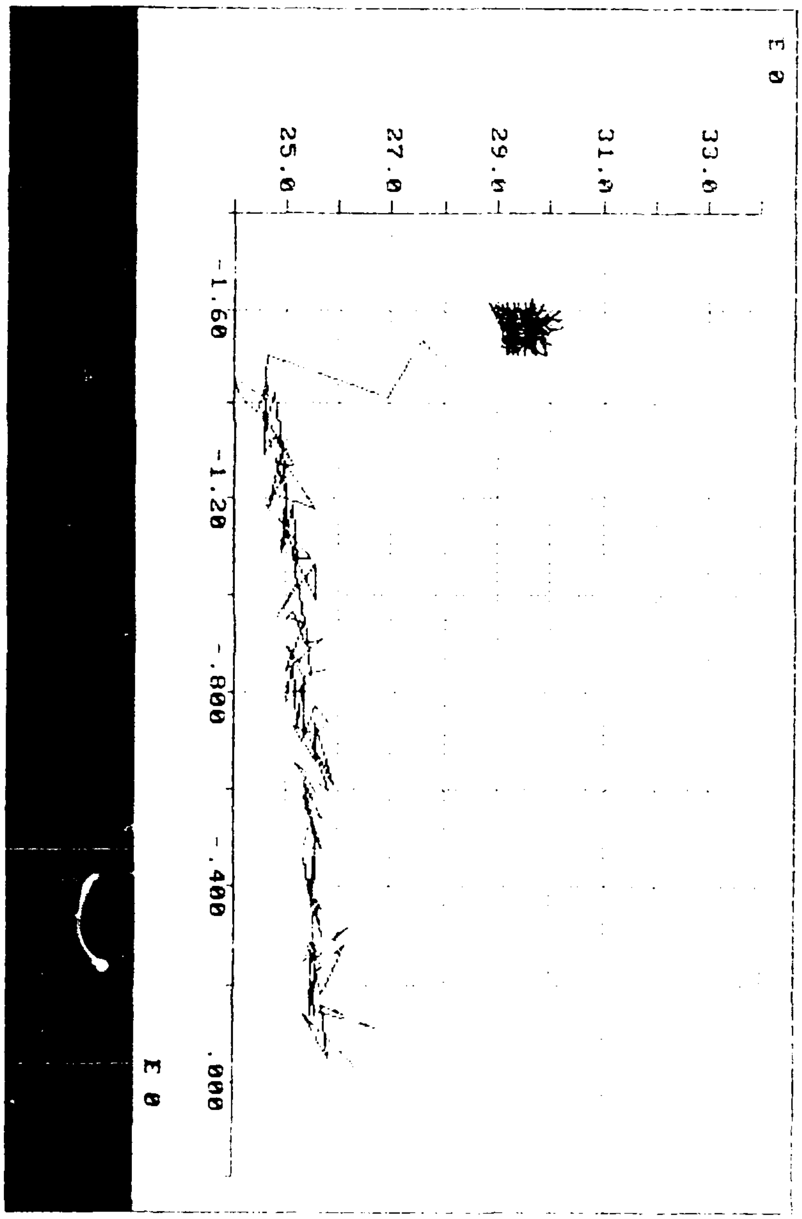
Mean Write append



: File Name: [illegible]

: Outfile:
: Row (Pixel):
: Start Column:
: # of Columns:

: Read/Write/Append



File Name:

Comment:

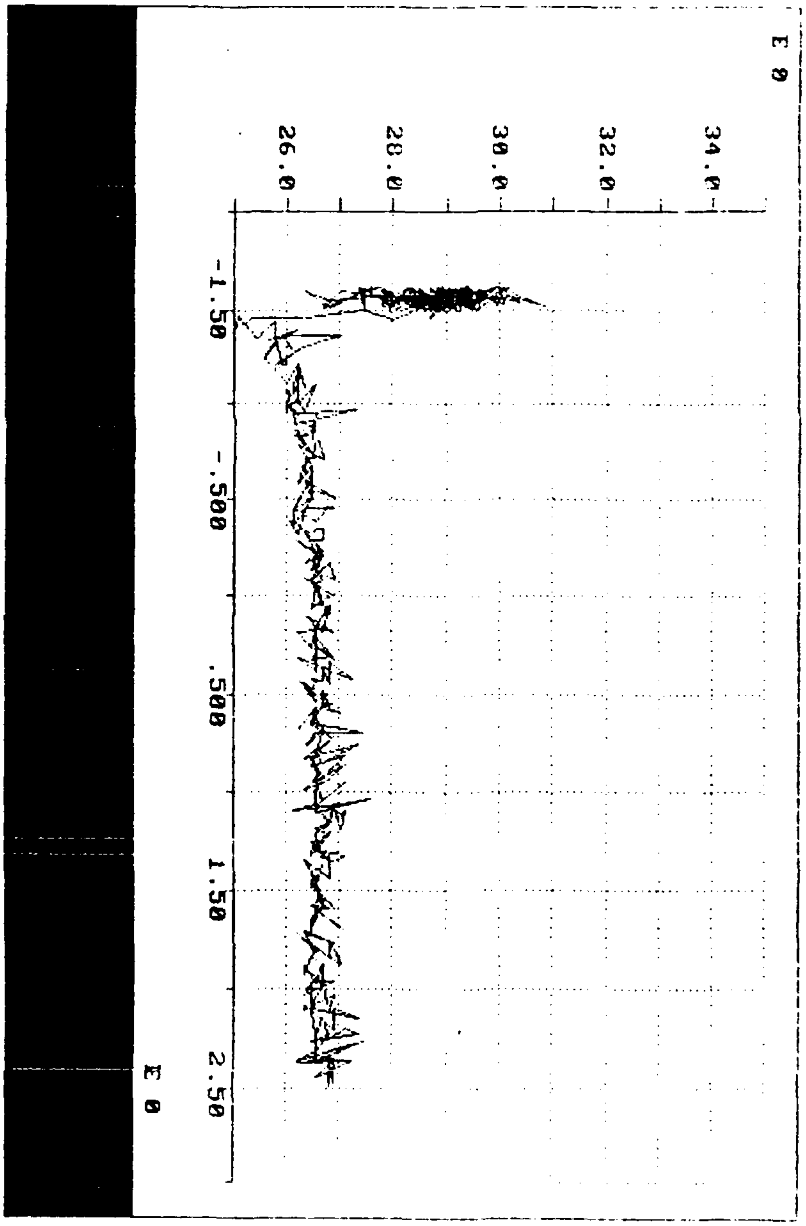
NO SMOKE

Subfile:

Start Column:

# of Columns:

Read/Write/Append



File Name:

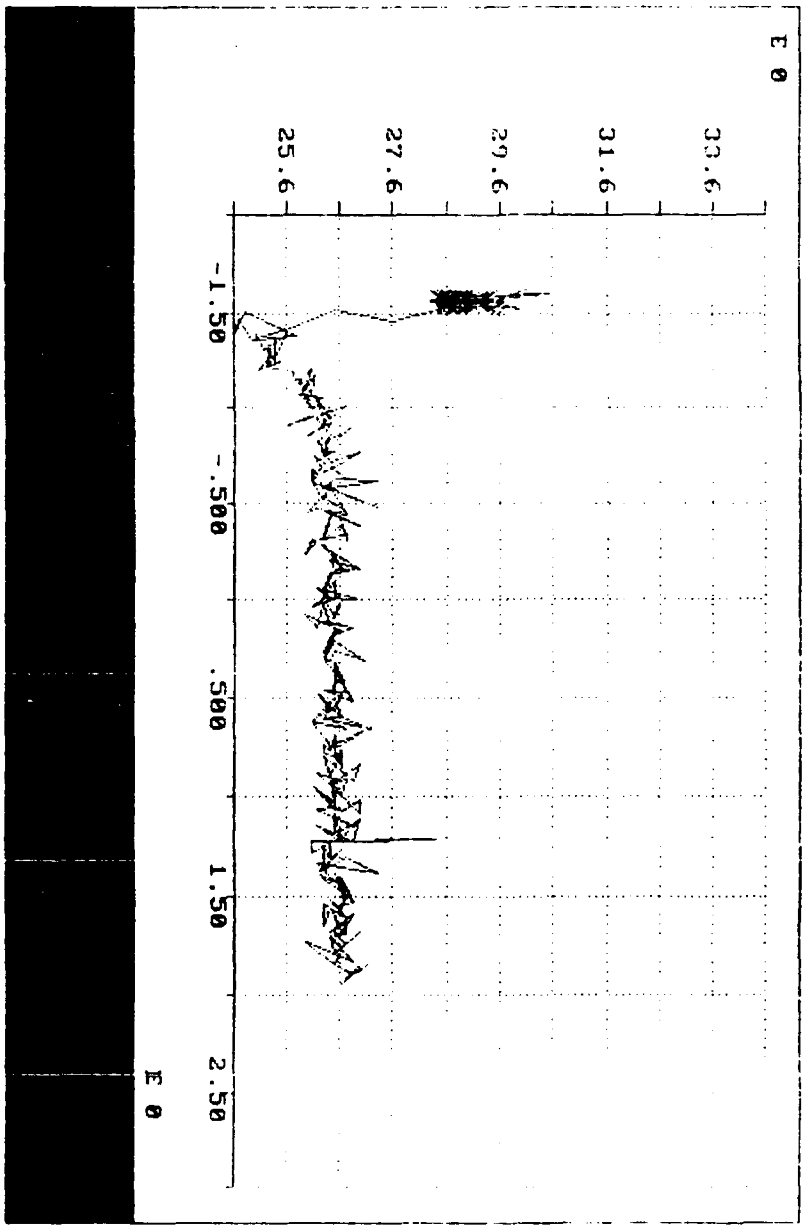
Comments

ICG 2X SET=100

VISIBLE

# of Columns:

Read/Write/Append:



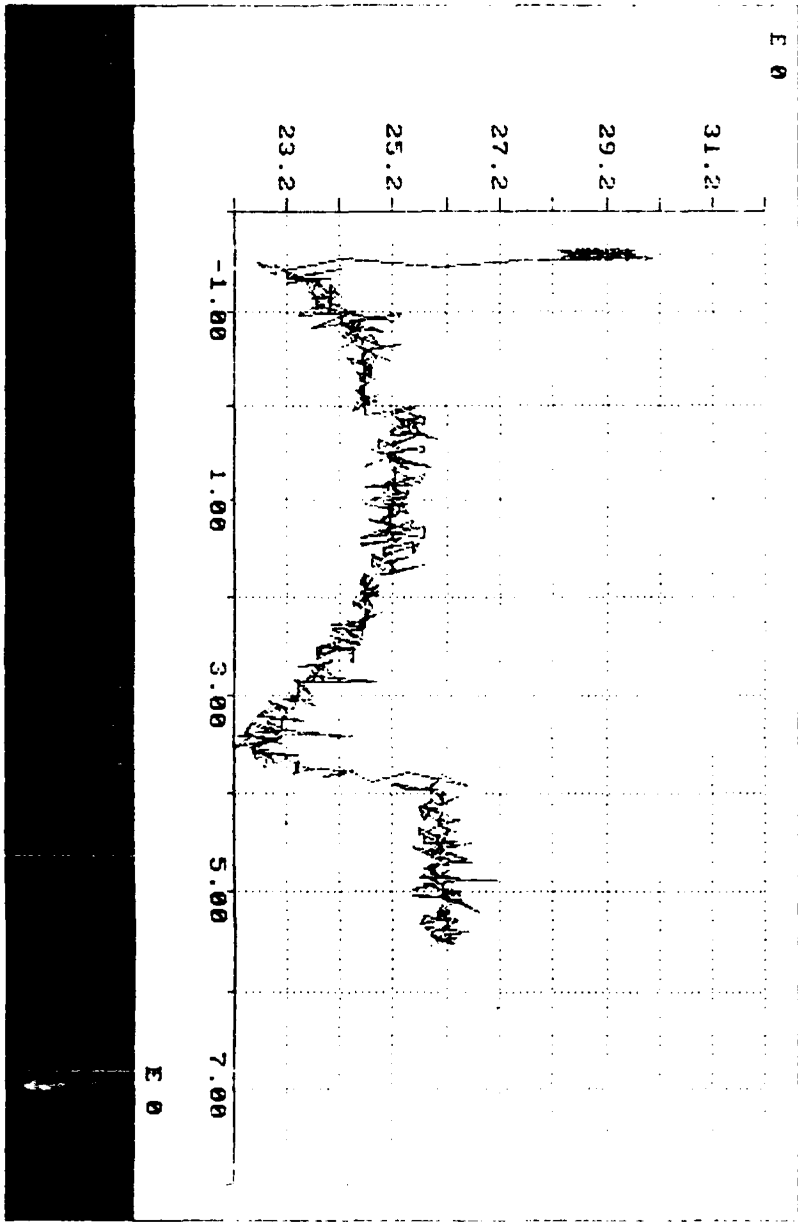
ile Name:

[illegible]

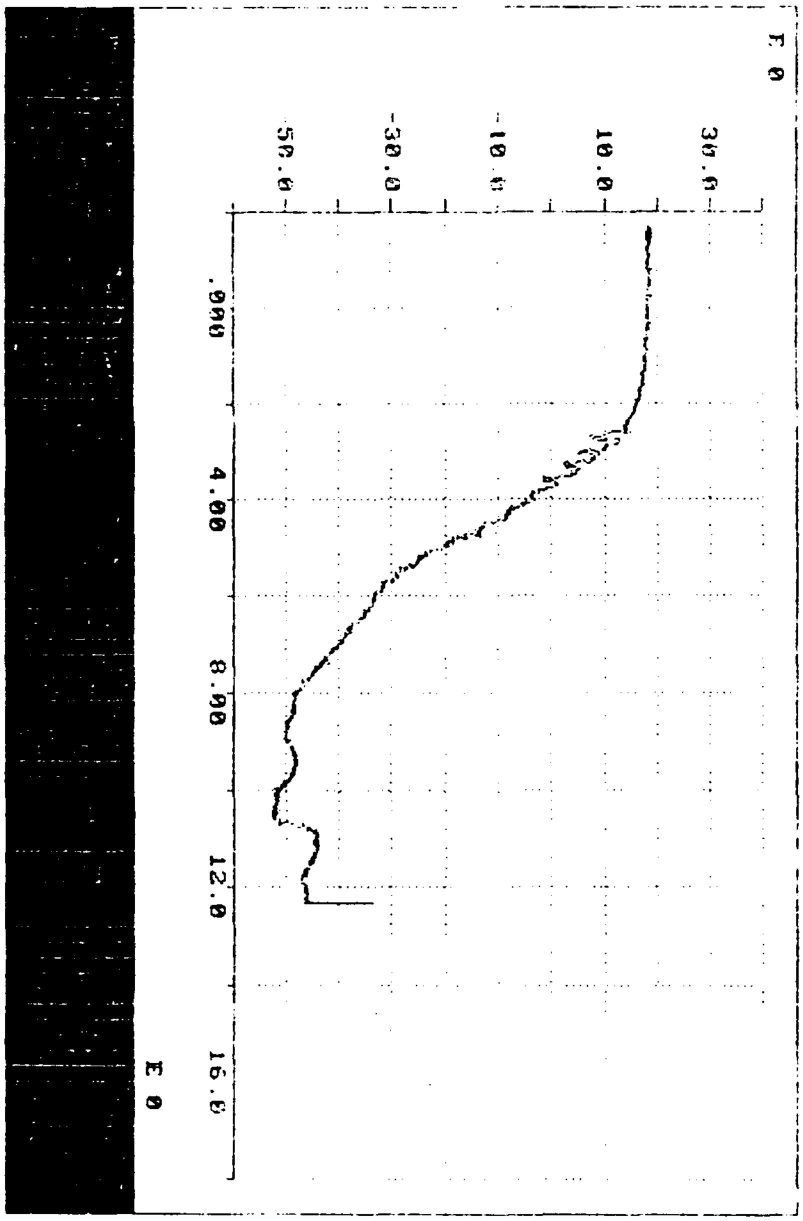
1 [illegible] INF CUR [illegible]
2 LANC [illegible]
3 NO SMP [illegible]
4
5 [illegible] TO [illegible]
6 TAKE AT [illegible]

[illegible]

[illegible] Column [illegible]



```
:
:    File Name:
:
:    S Comments
: 1  ONE STRIP ...
: 2  PROKE AT NO...
:
: Variable
:
:  Subfile:
:  Row (0=all):
:  Start Column:
:  # of Columns:
:
:  Read/Write/Append
:
```



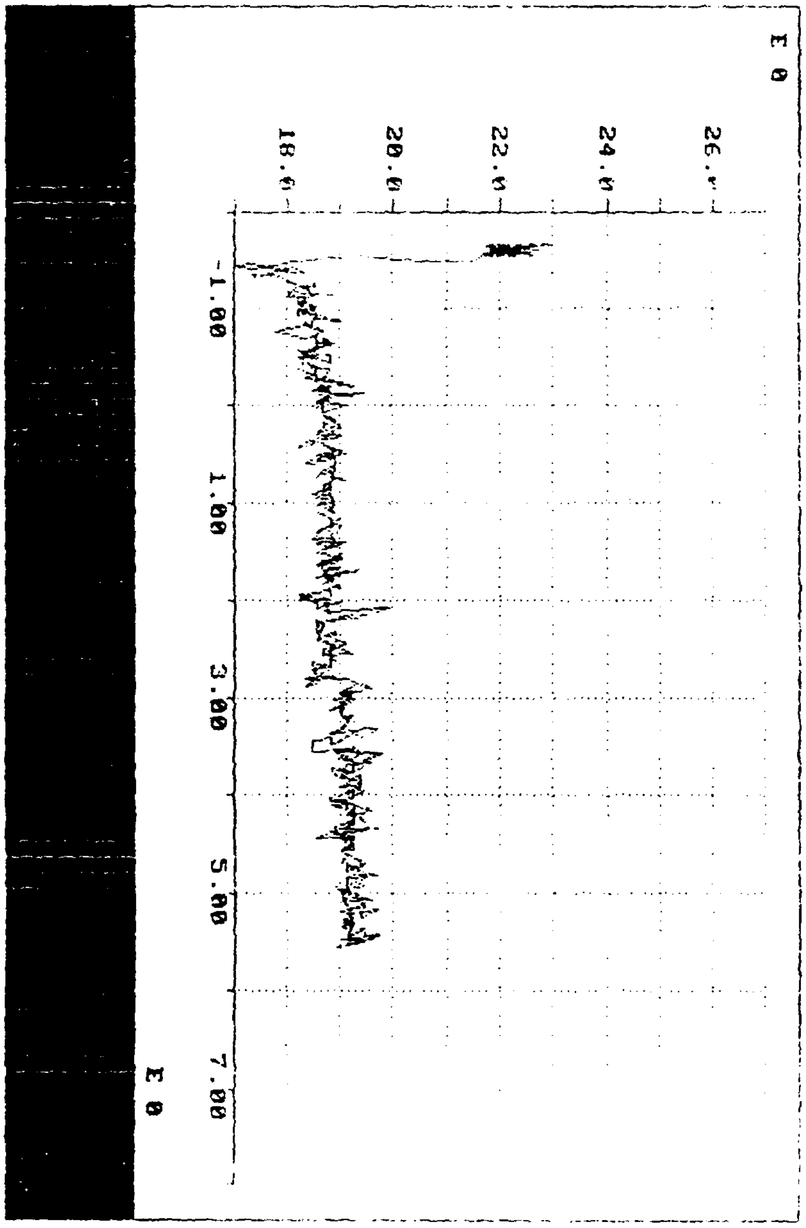
File Name:

9 Comments

I/O Variable

Subfile:
Row (O=all):
Start Column:
# of Columns:

Read/Write/Append



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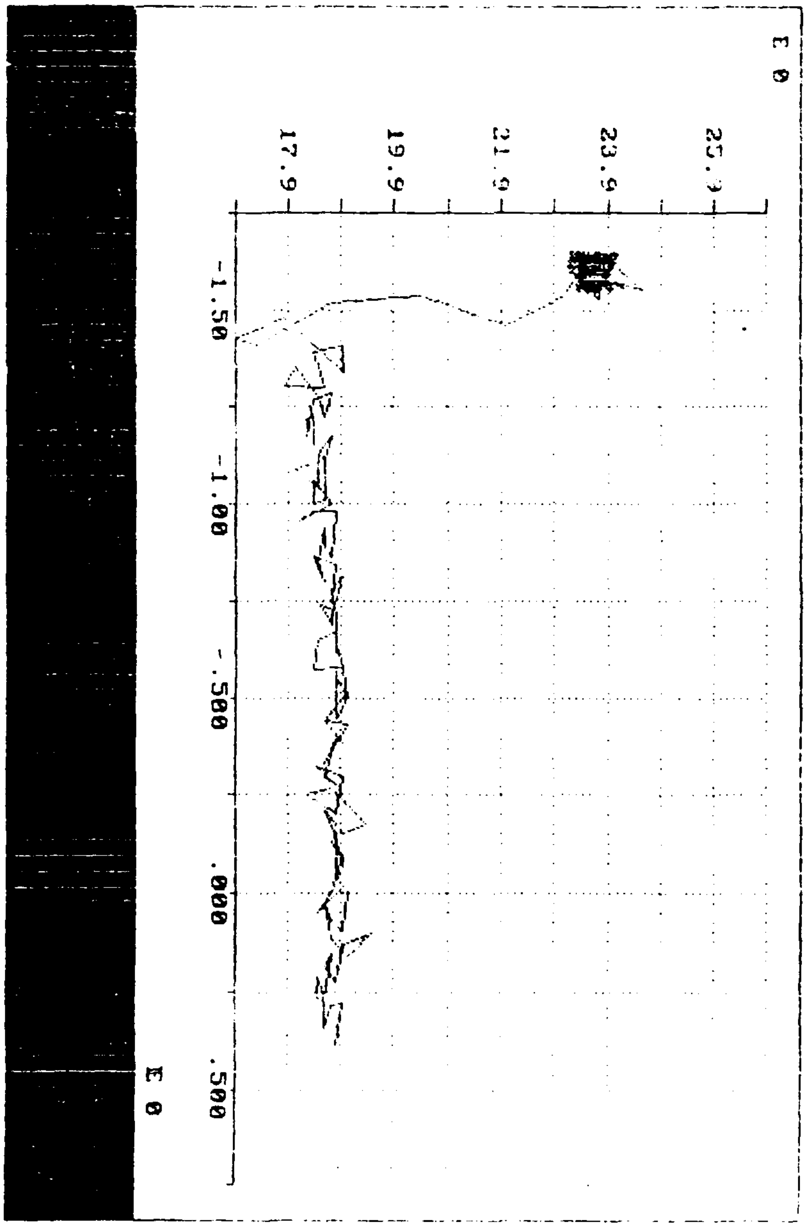

File Name: [illegible]

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1) BLOOD CONTROL[illegible]

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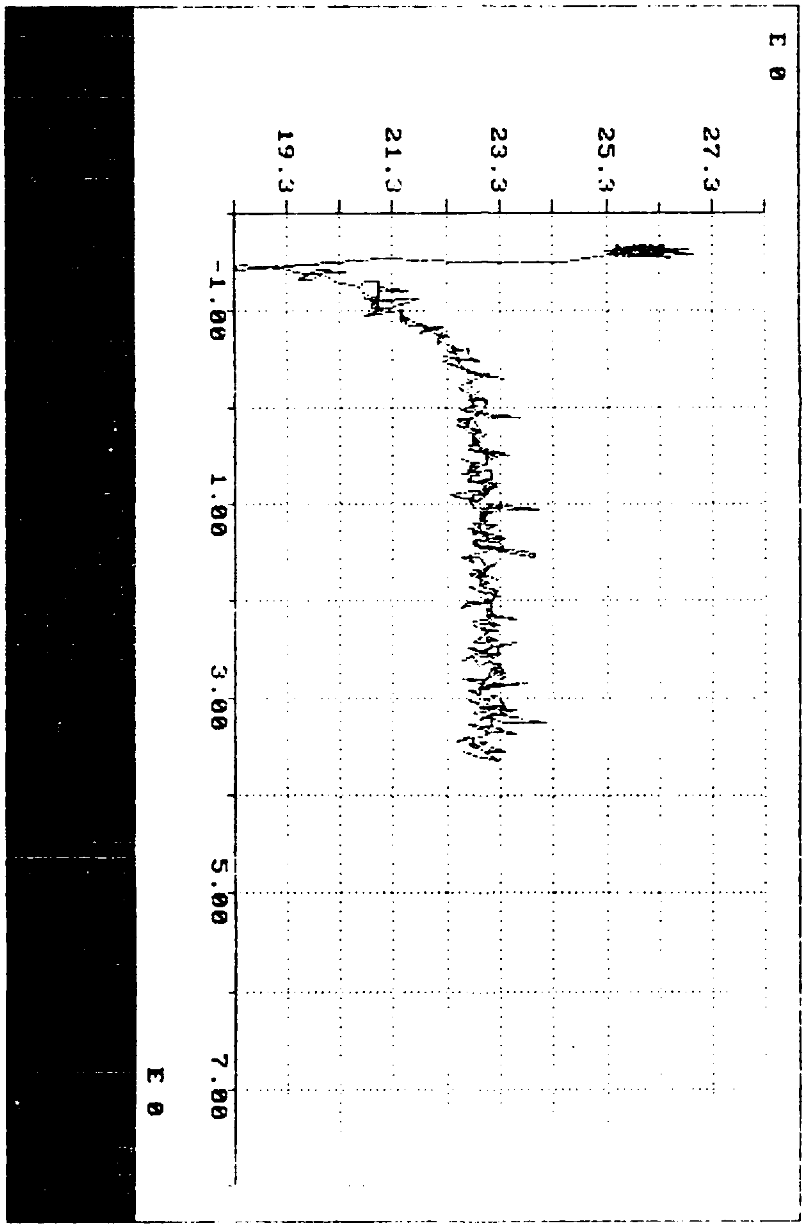

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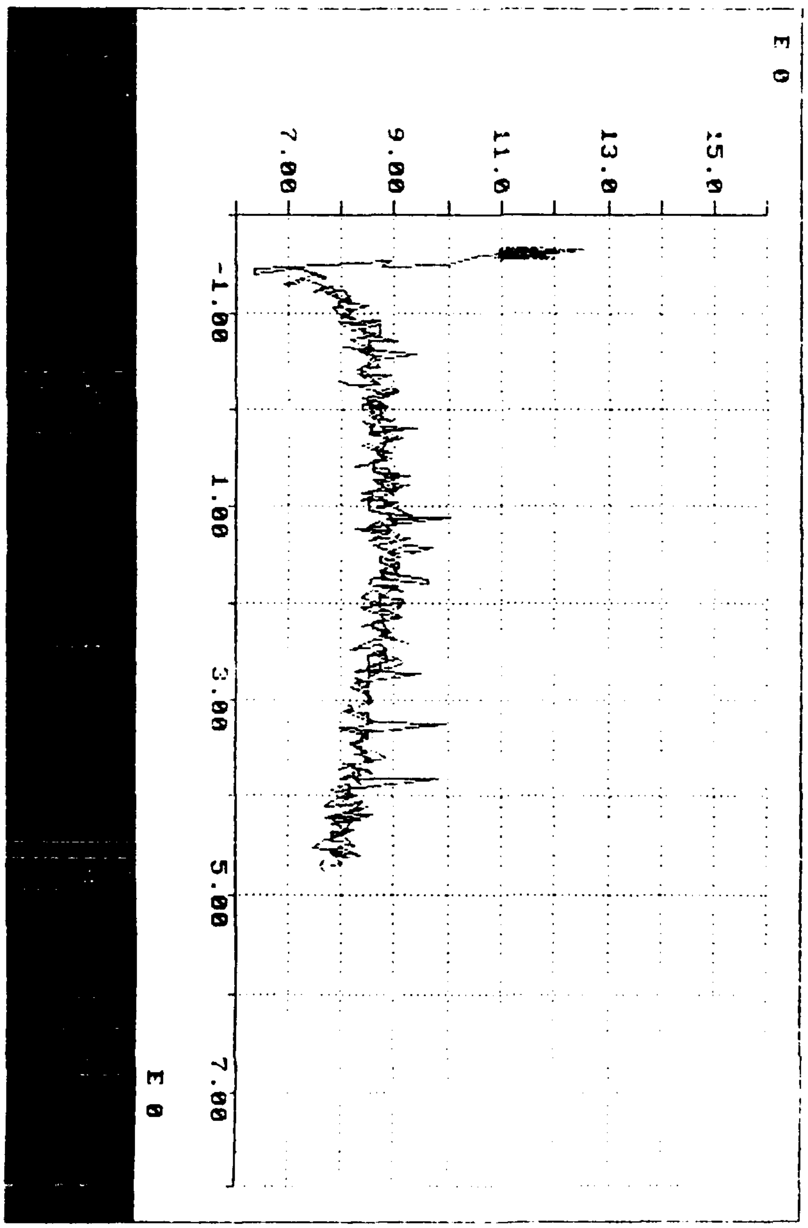

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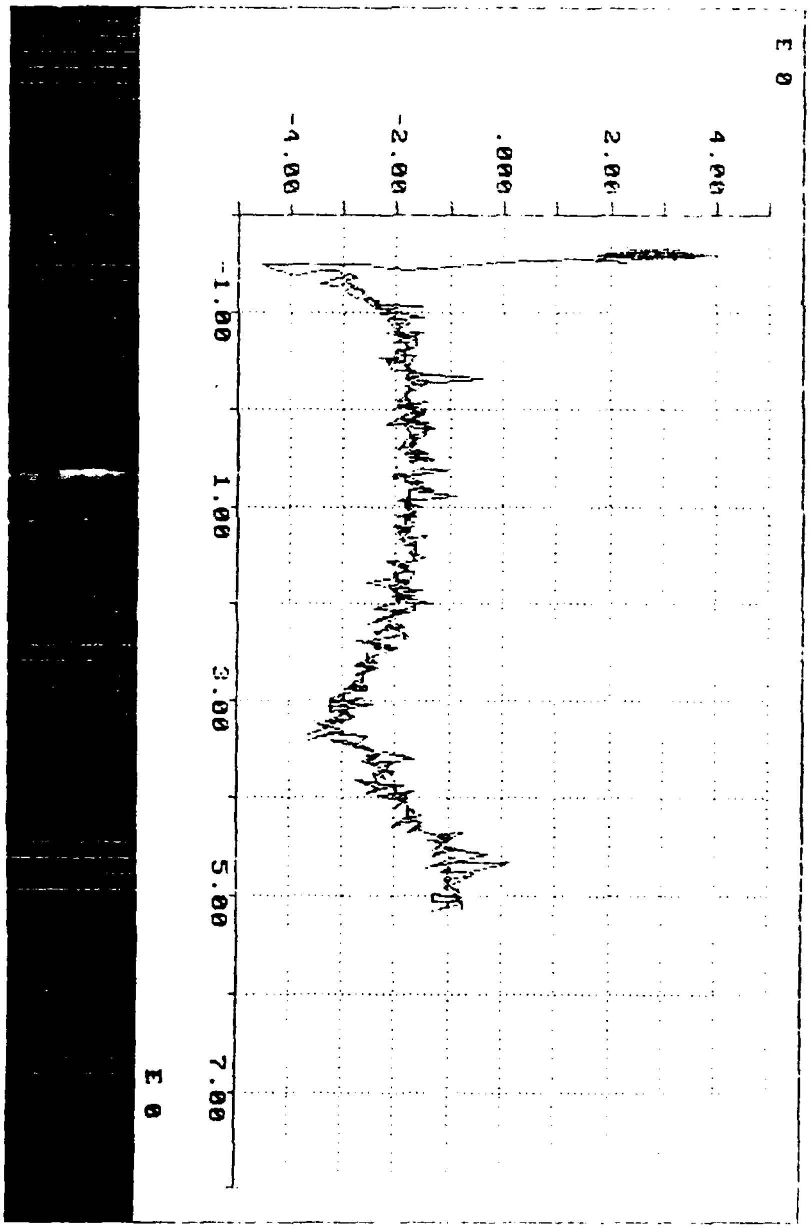

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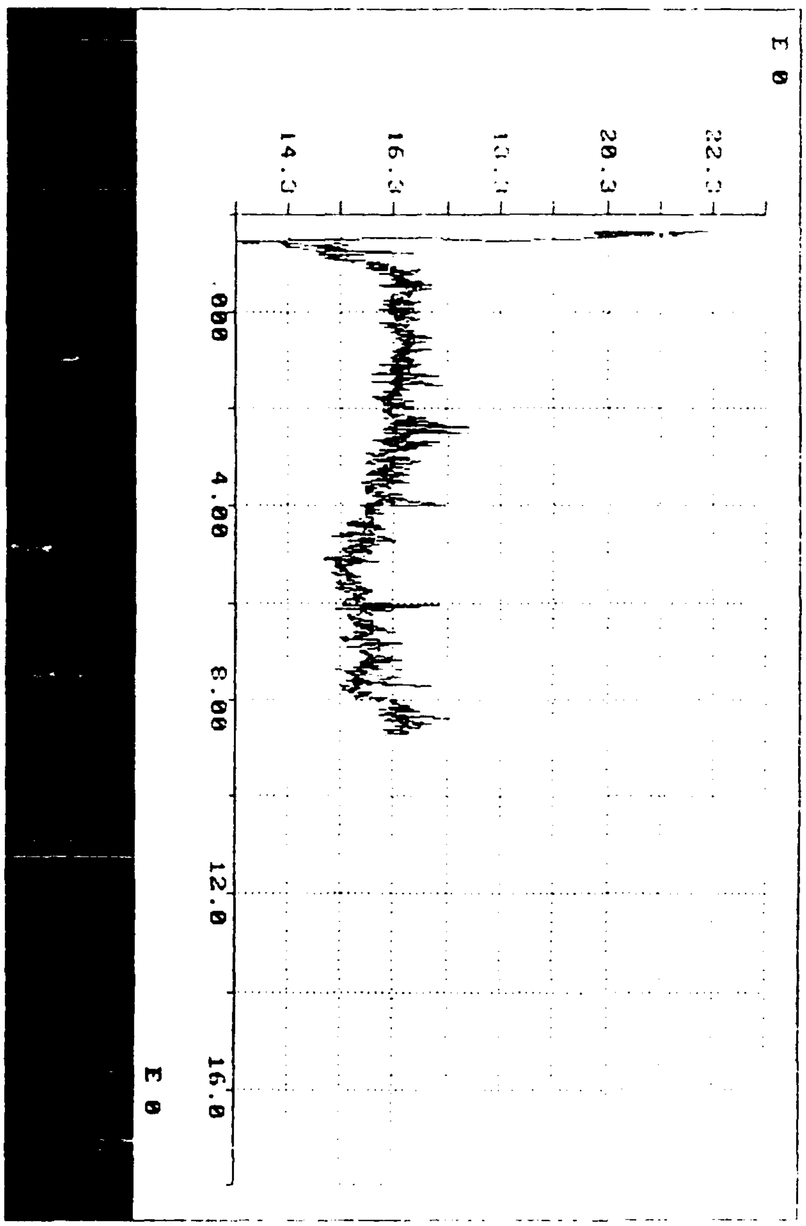

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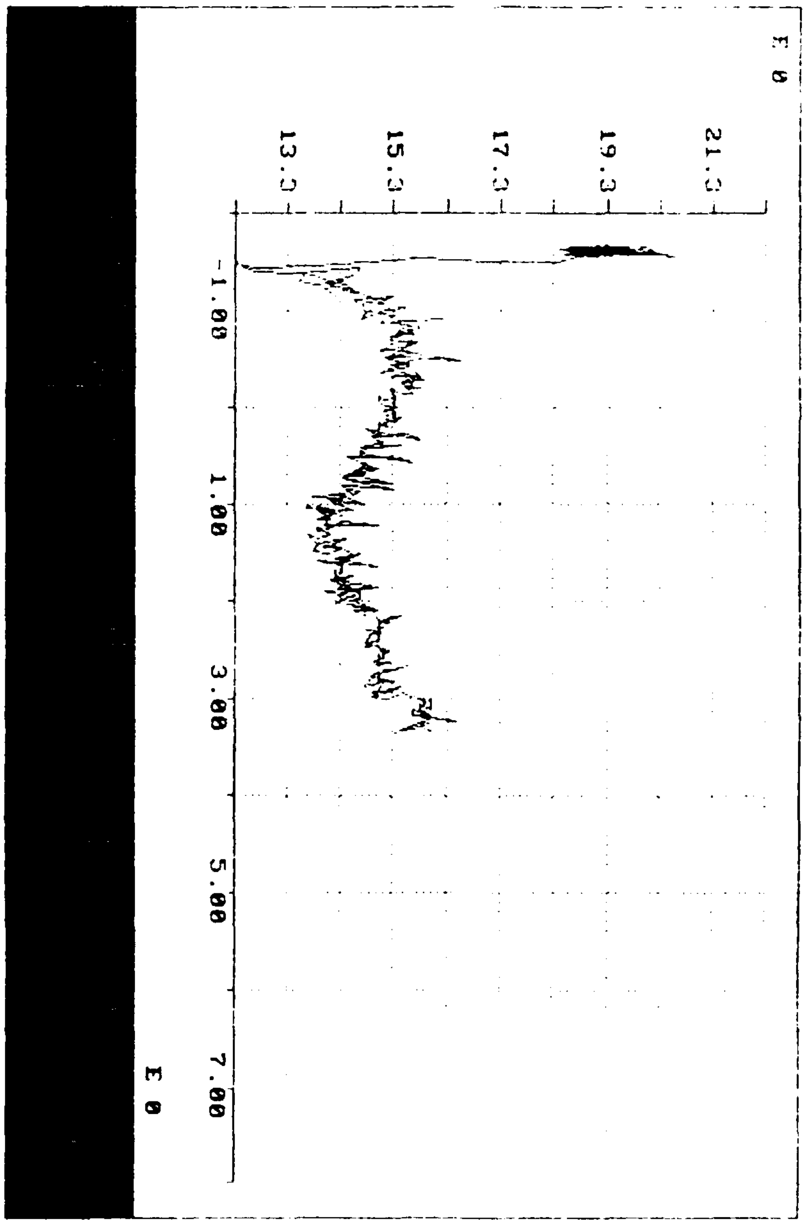

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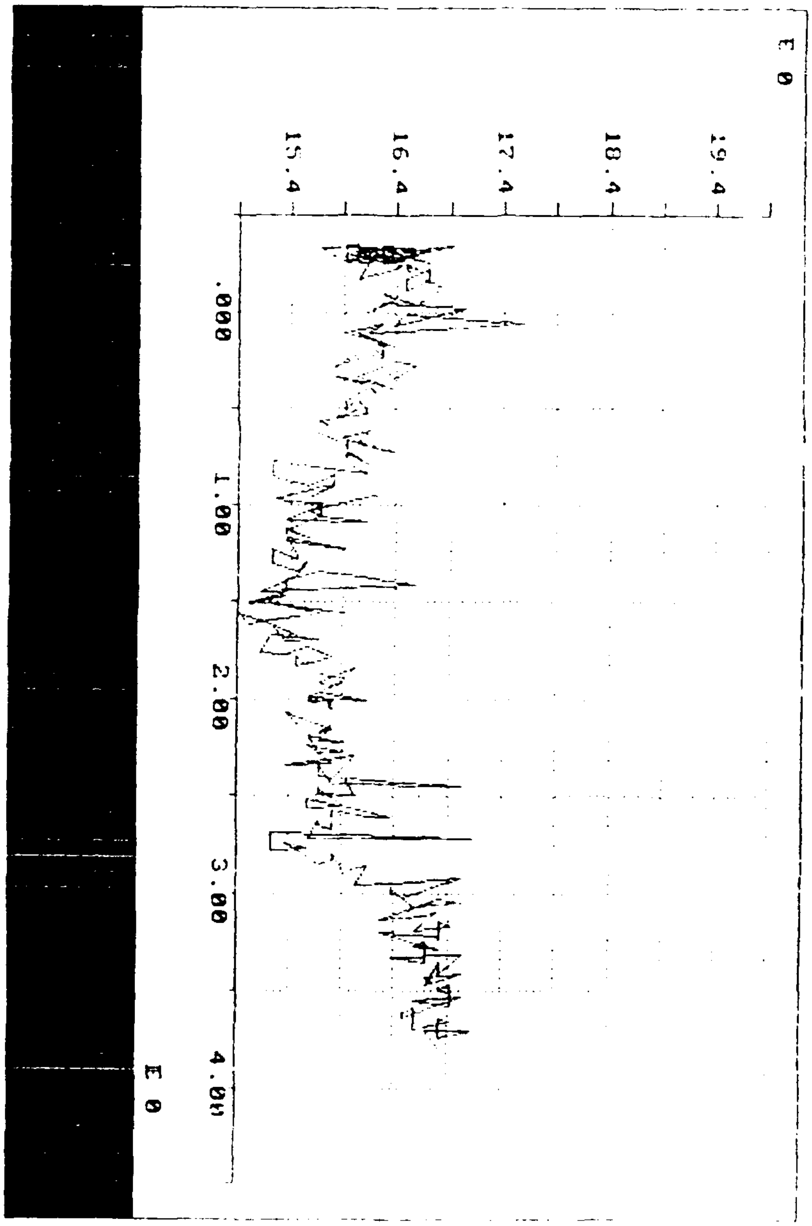

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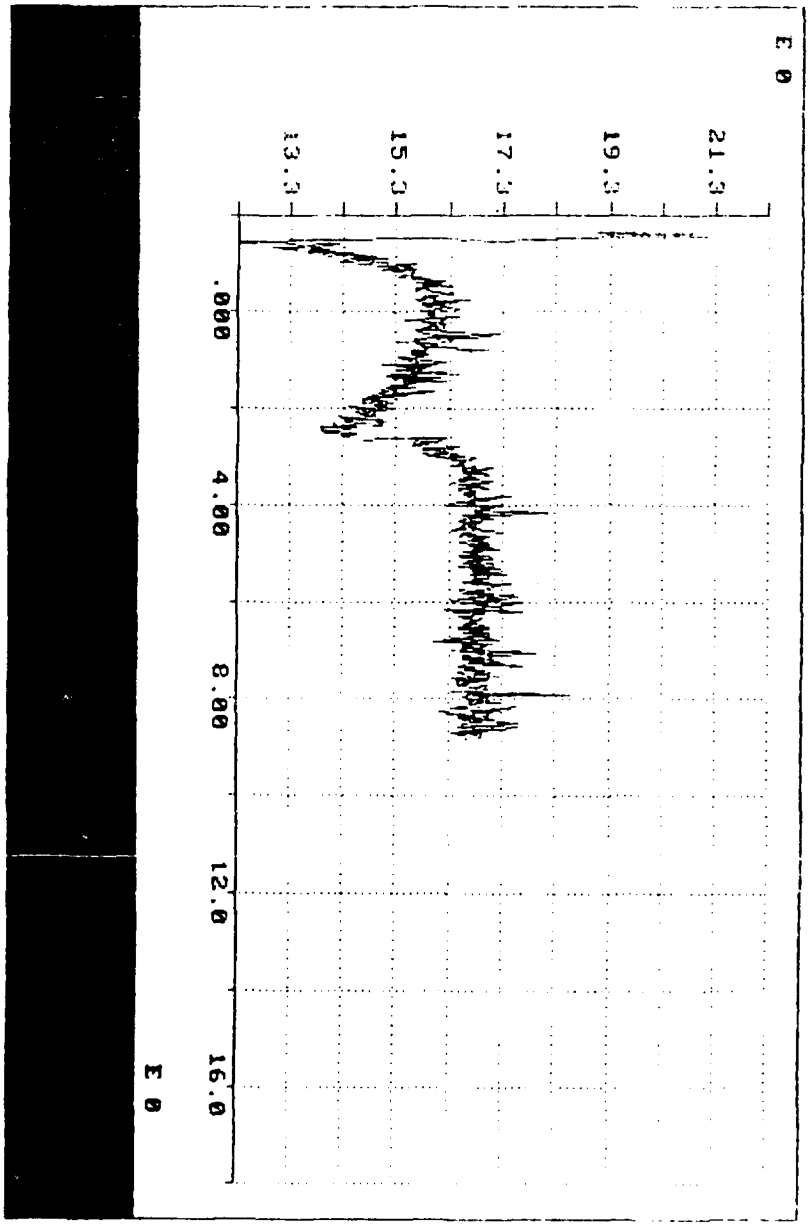

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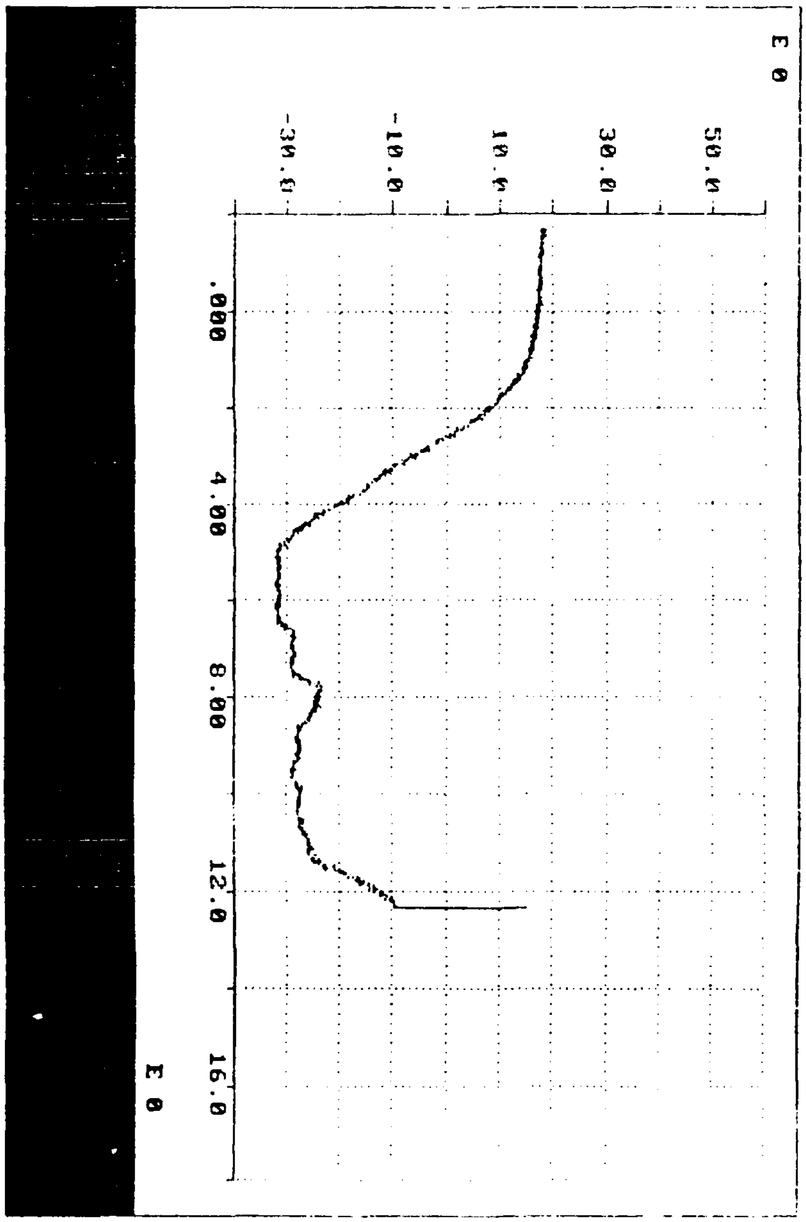

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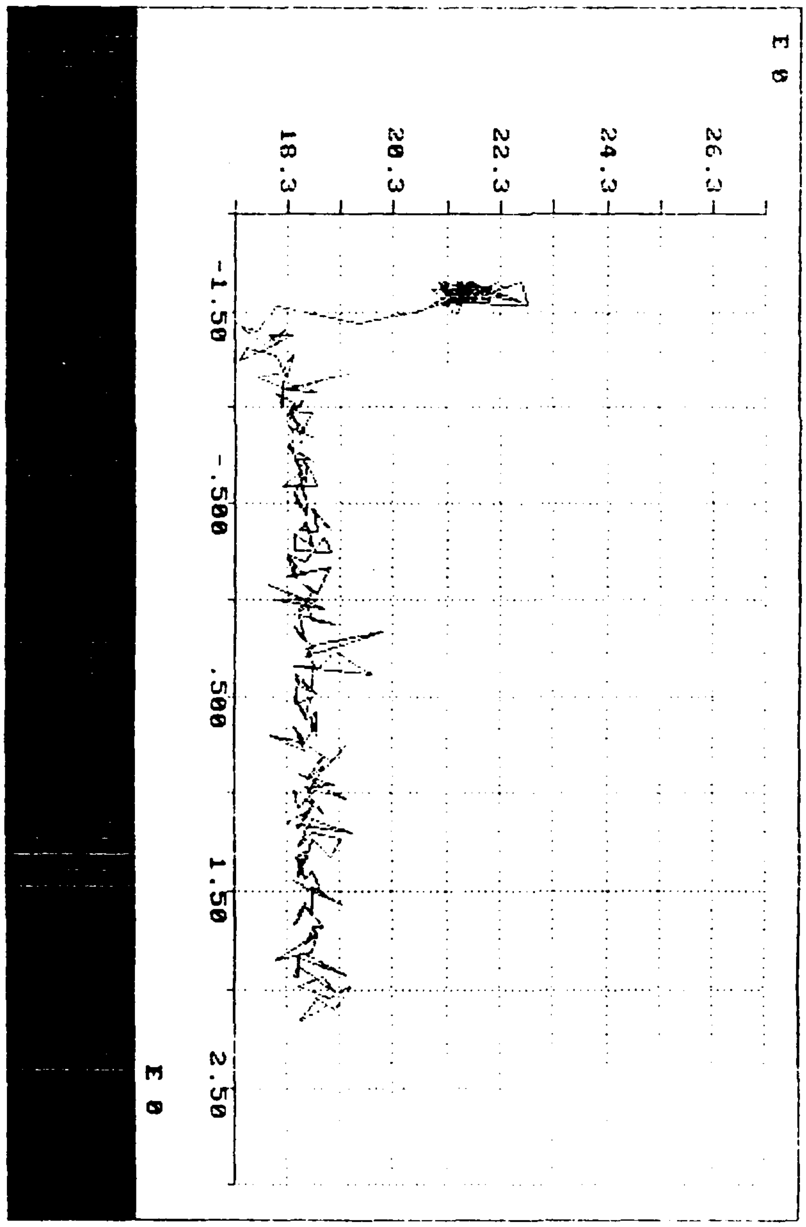

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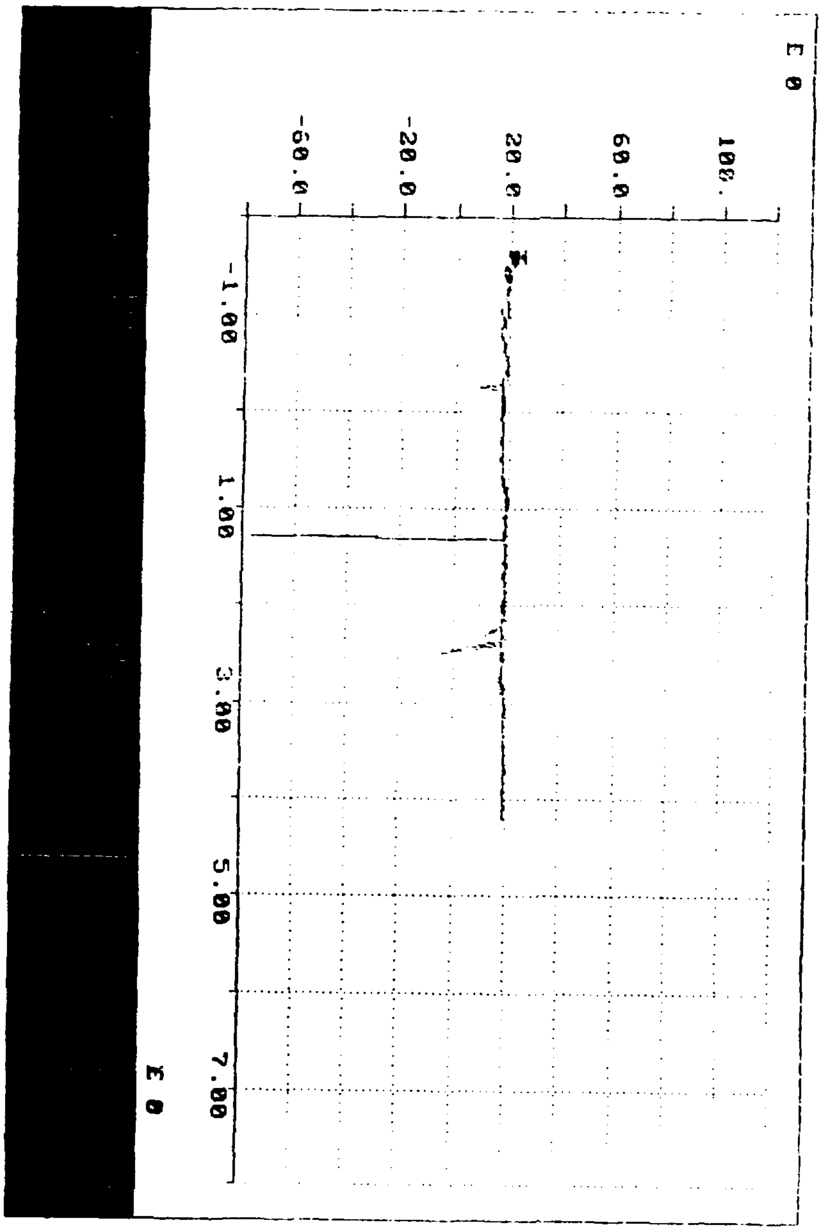

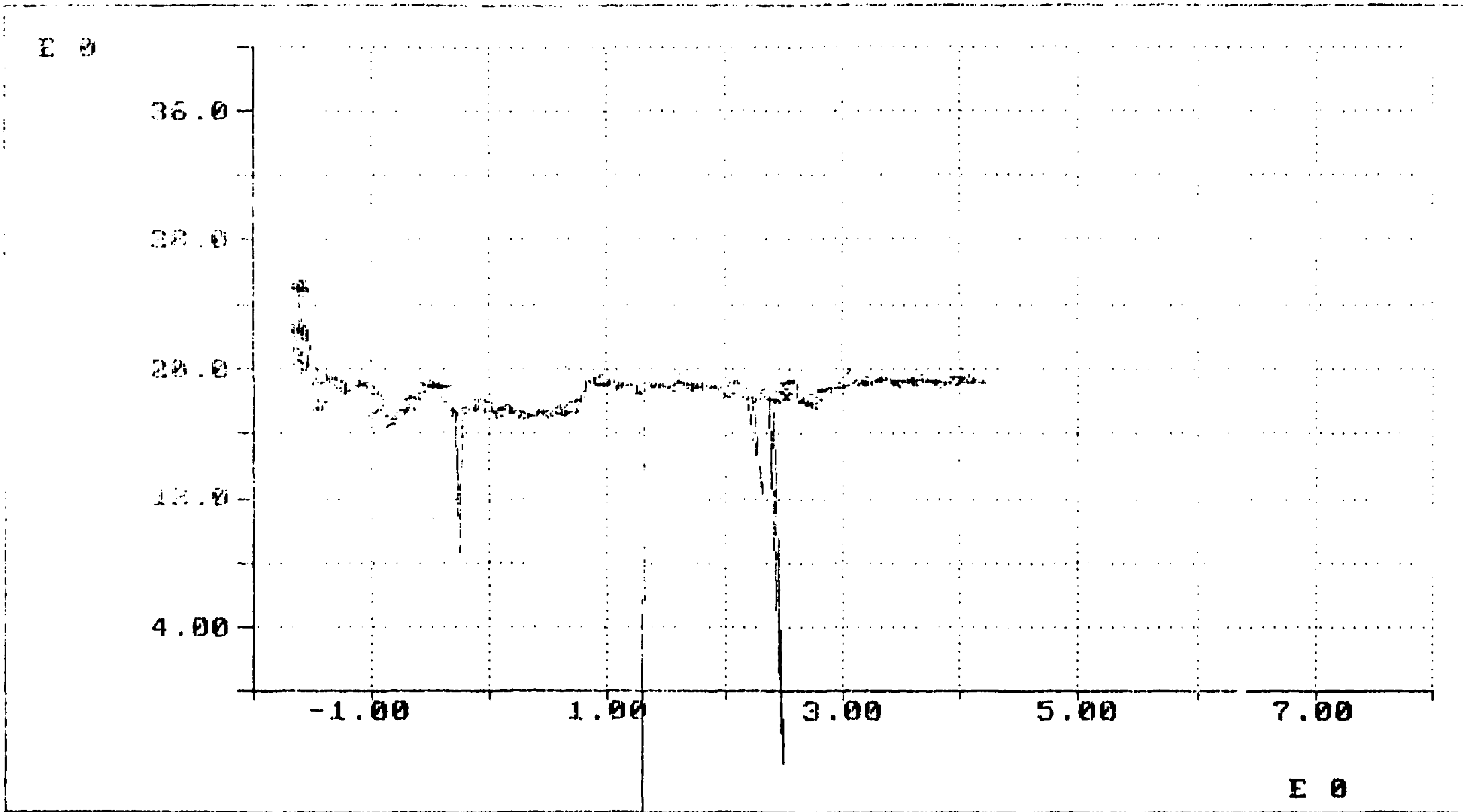
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: 3 ... SMOKE

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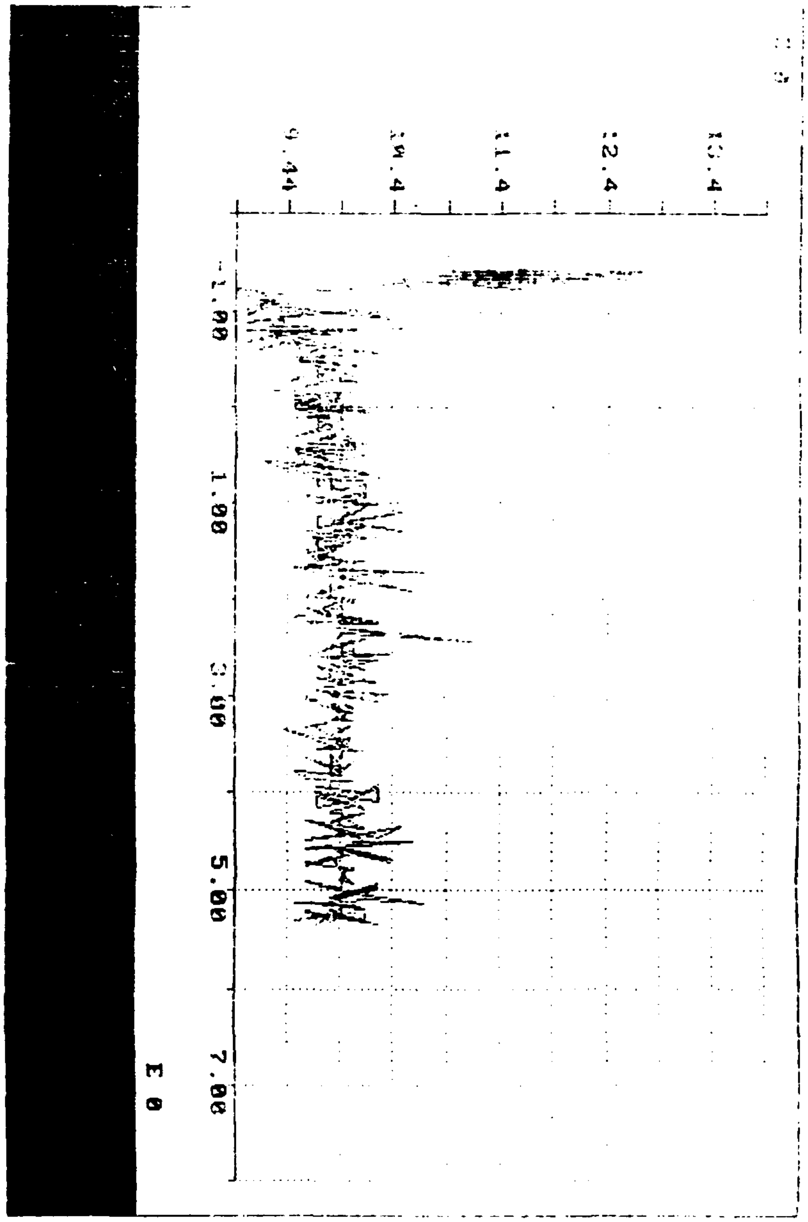

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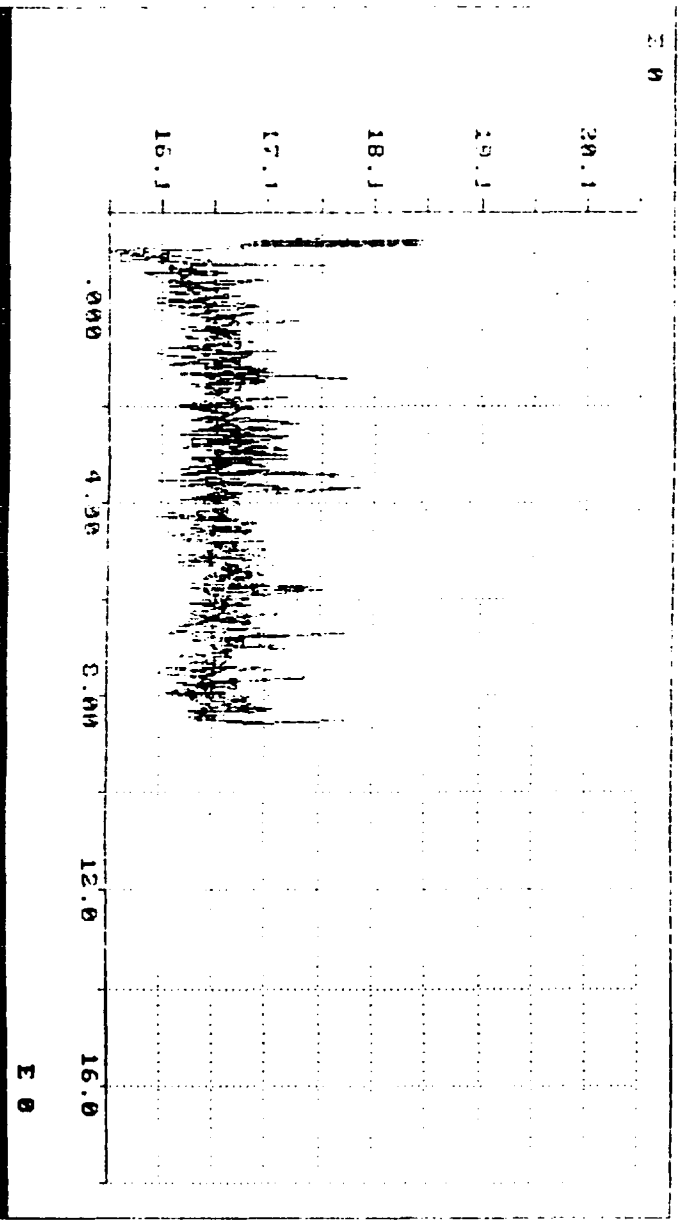

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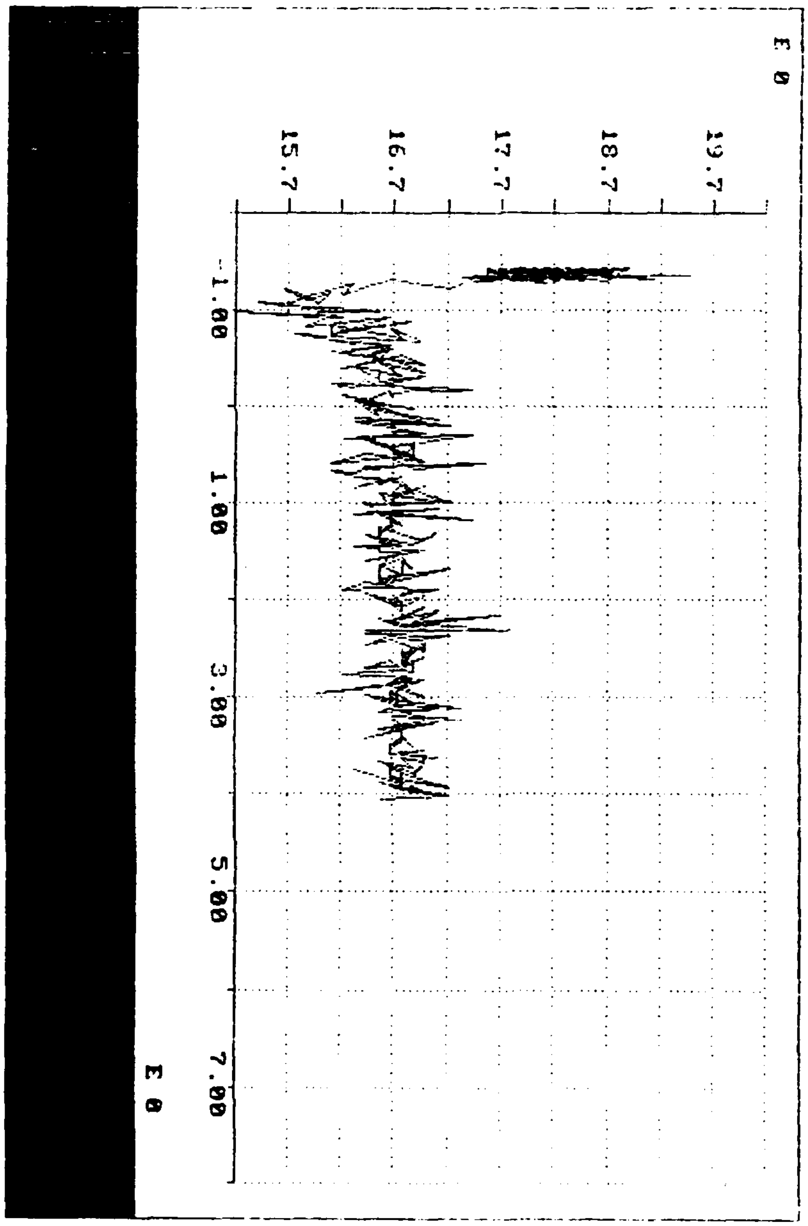

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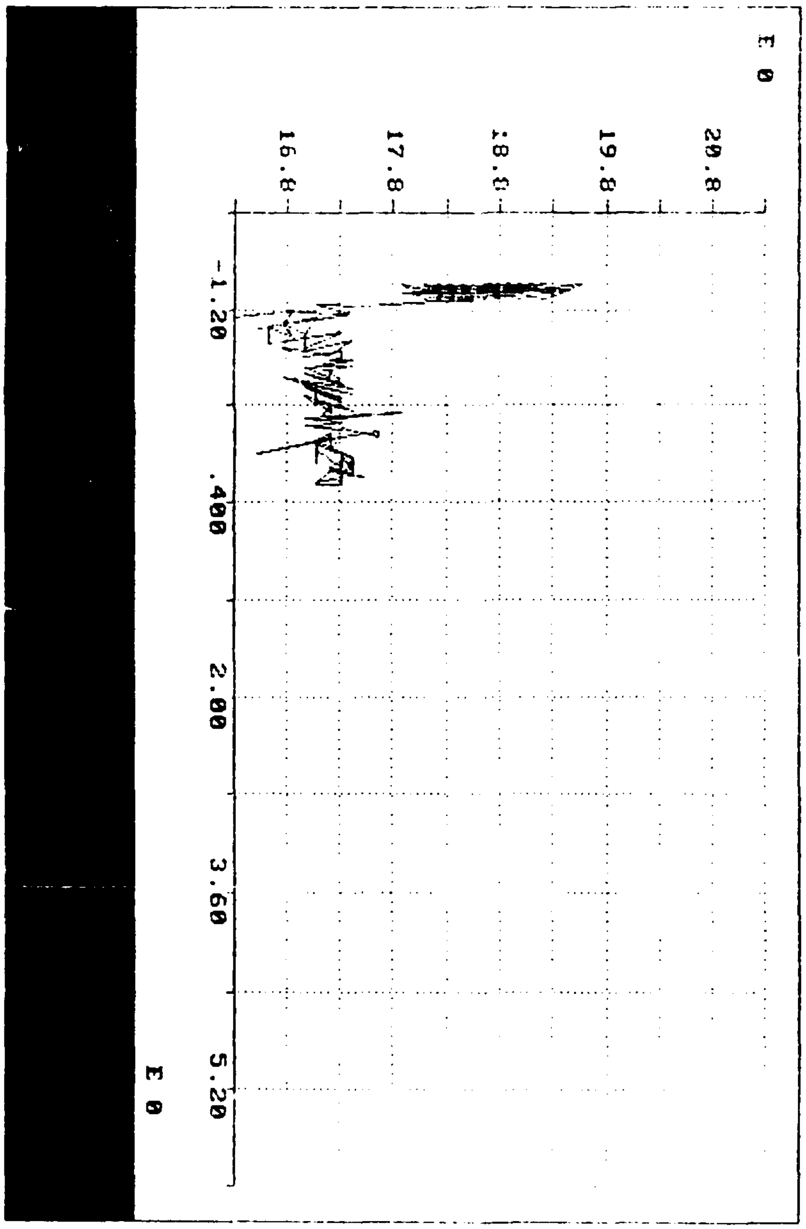

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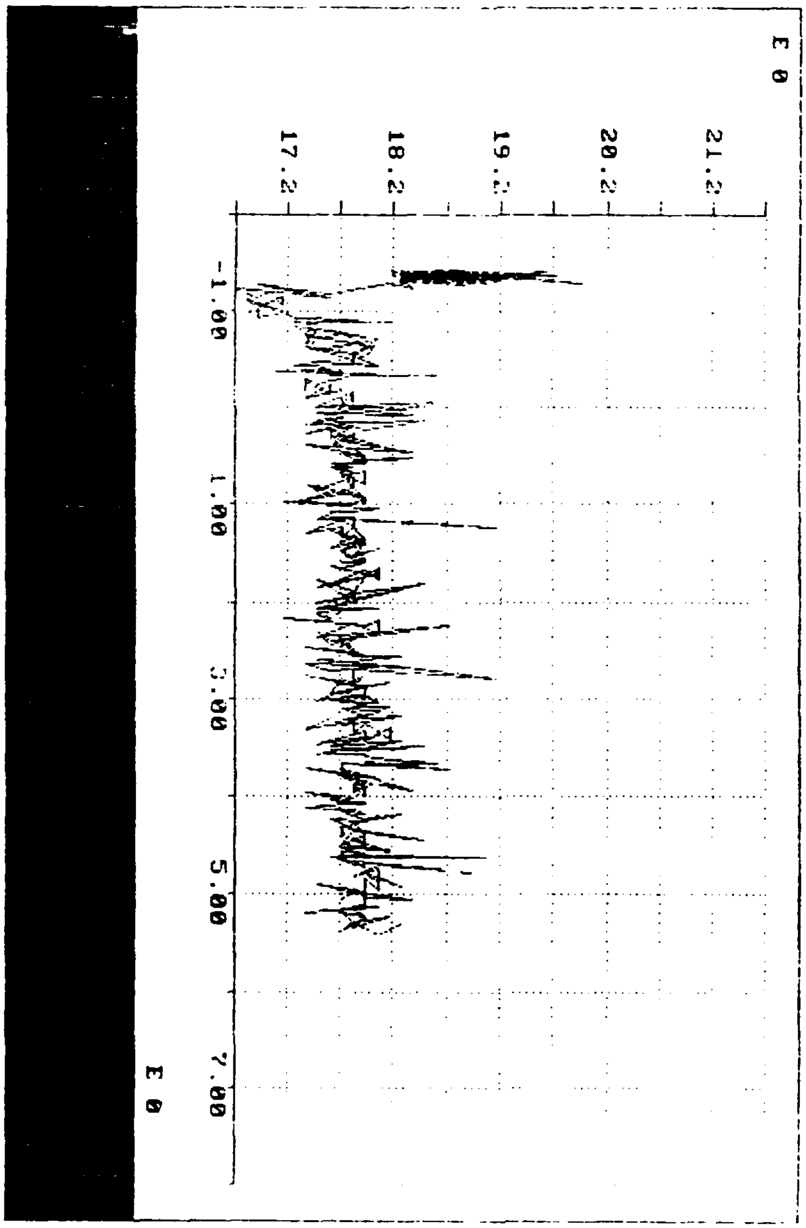

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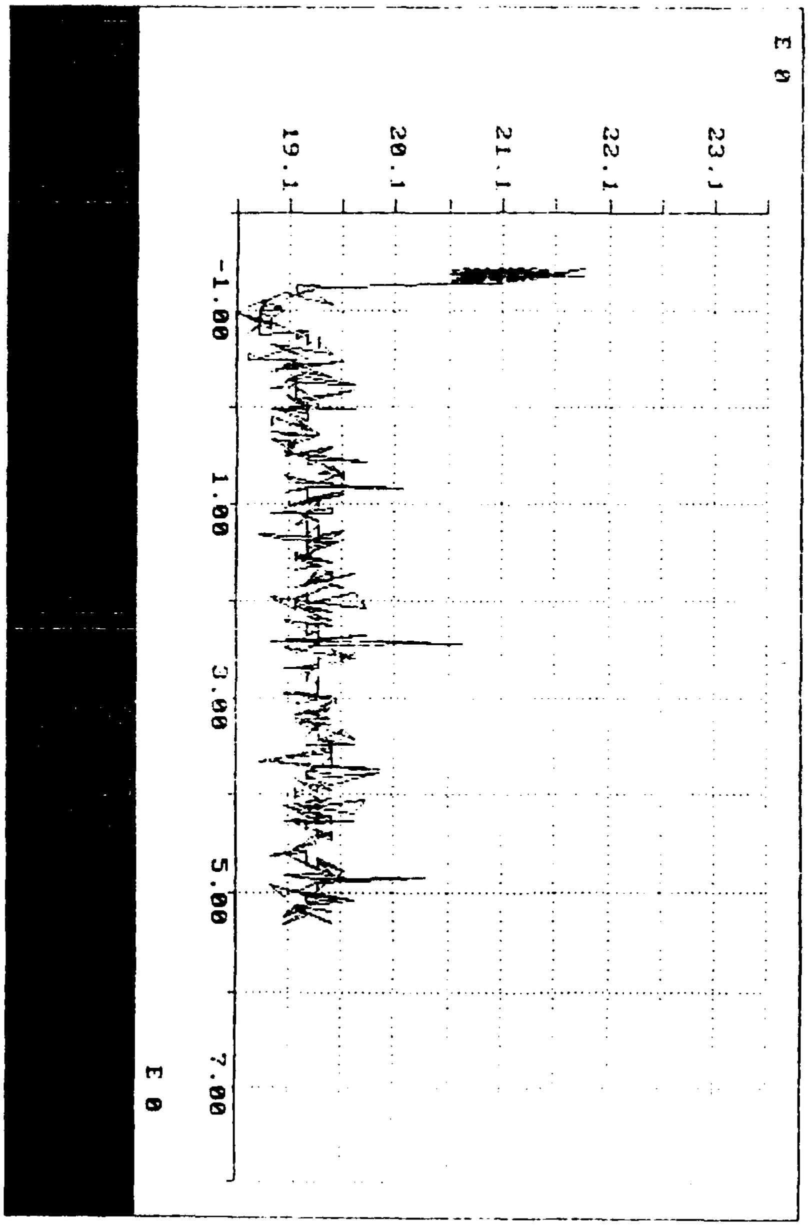

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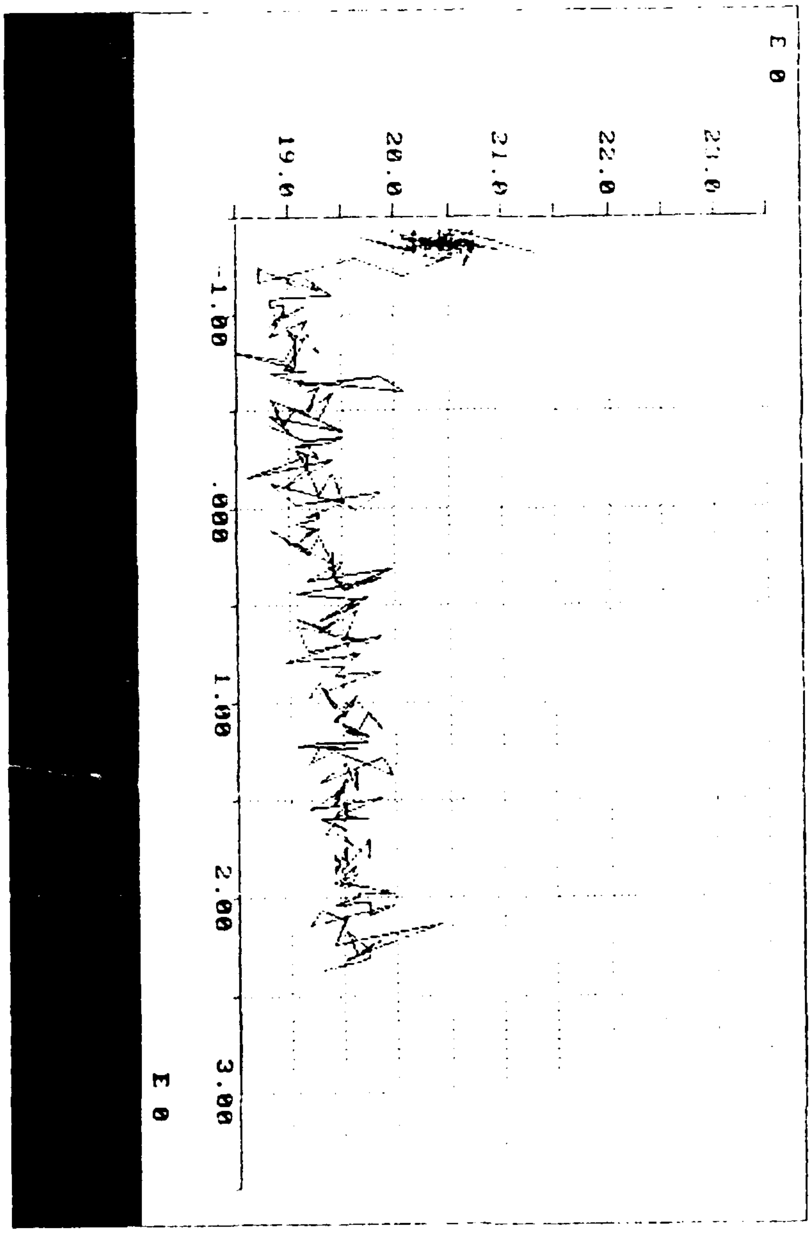

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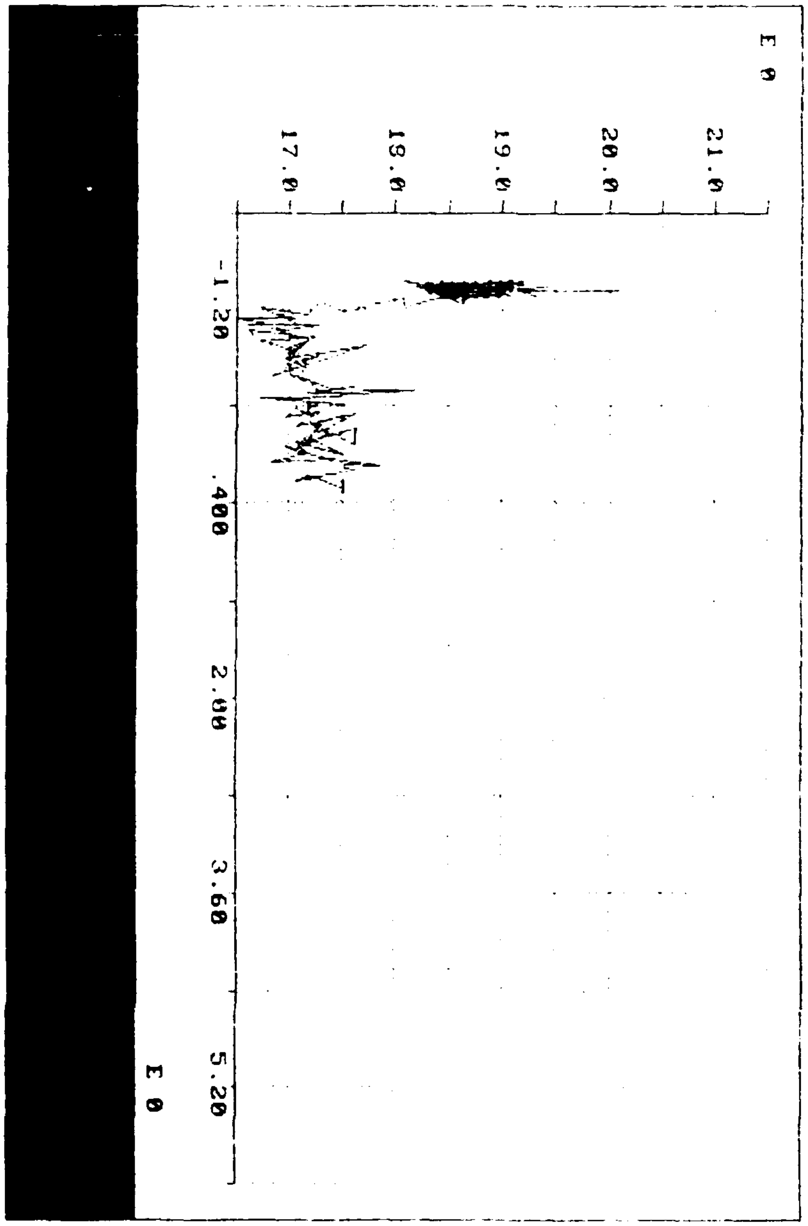

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4 NO SMOKE

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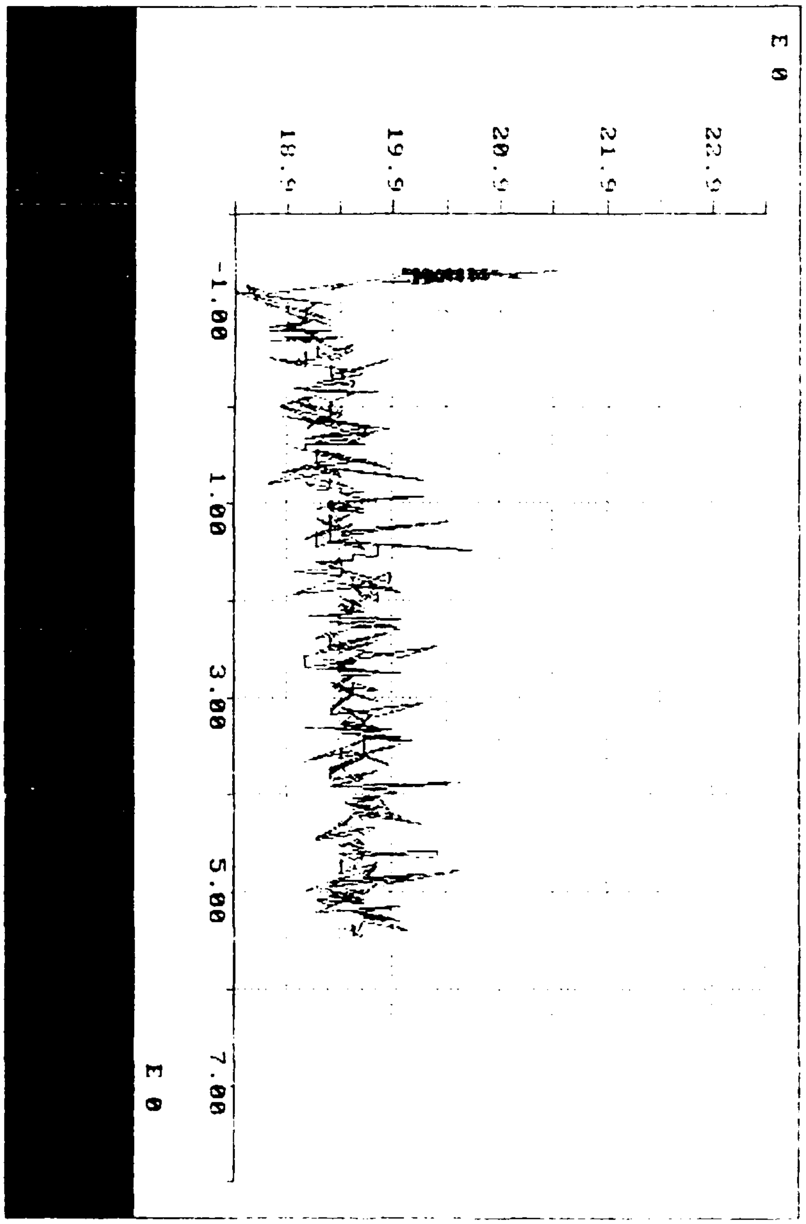

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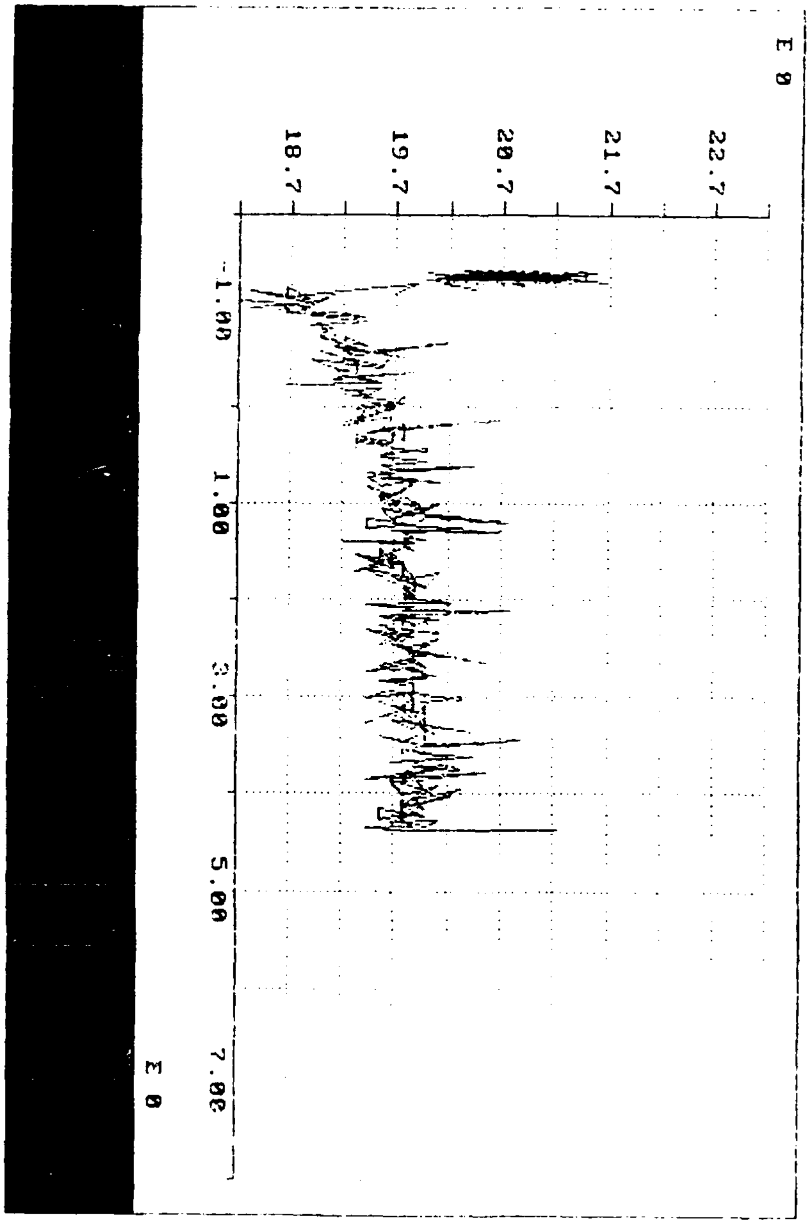

File Name:

8 Comments

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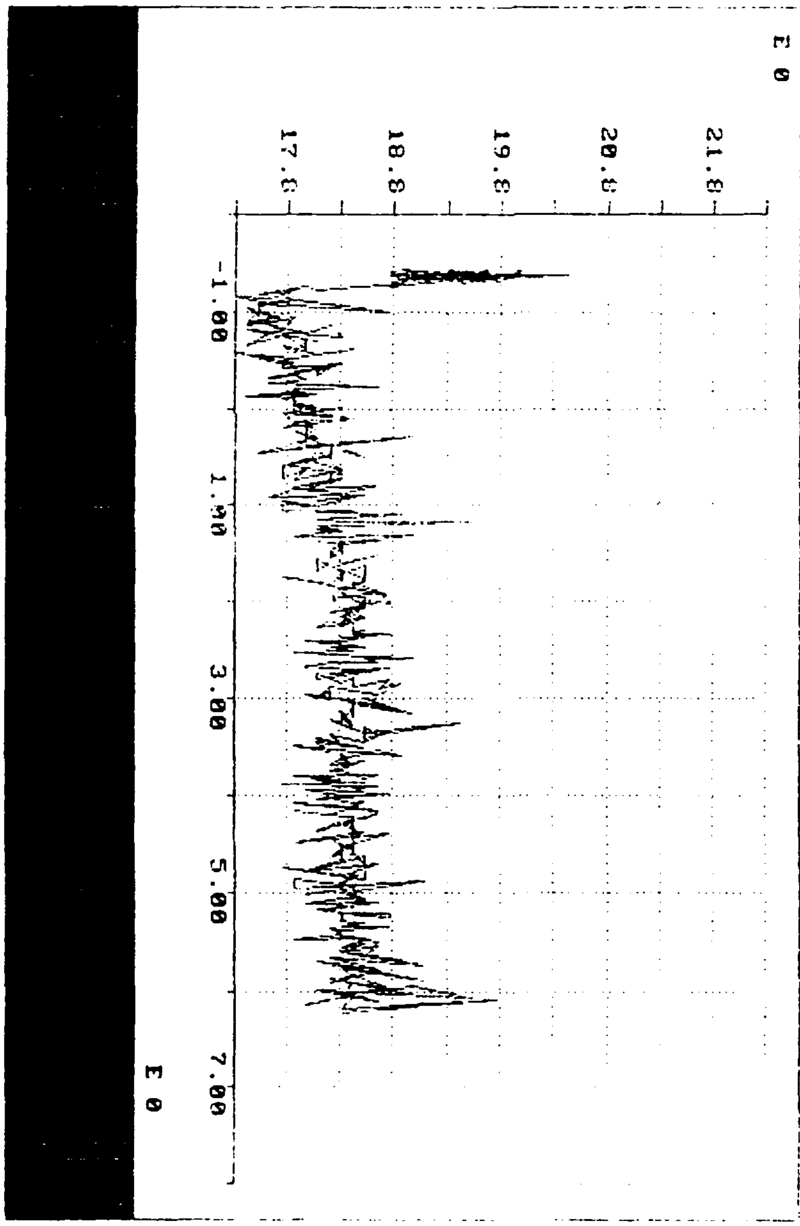

Appendix C- Supplemental Figures and Illustrations

Figure 1- Thermocouple Placement

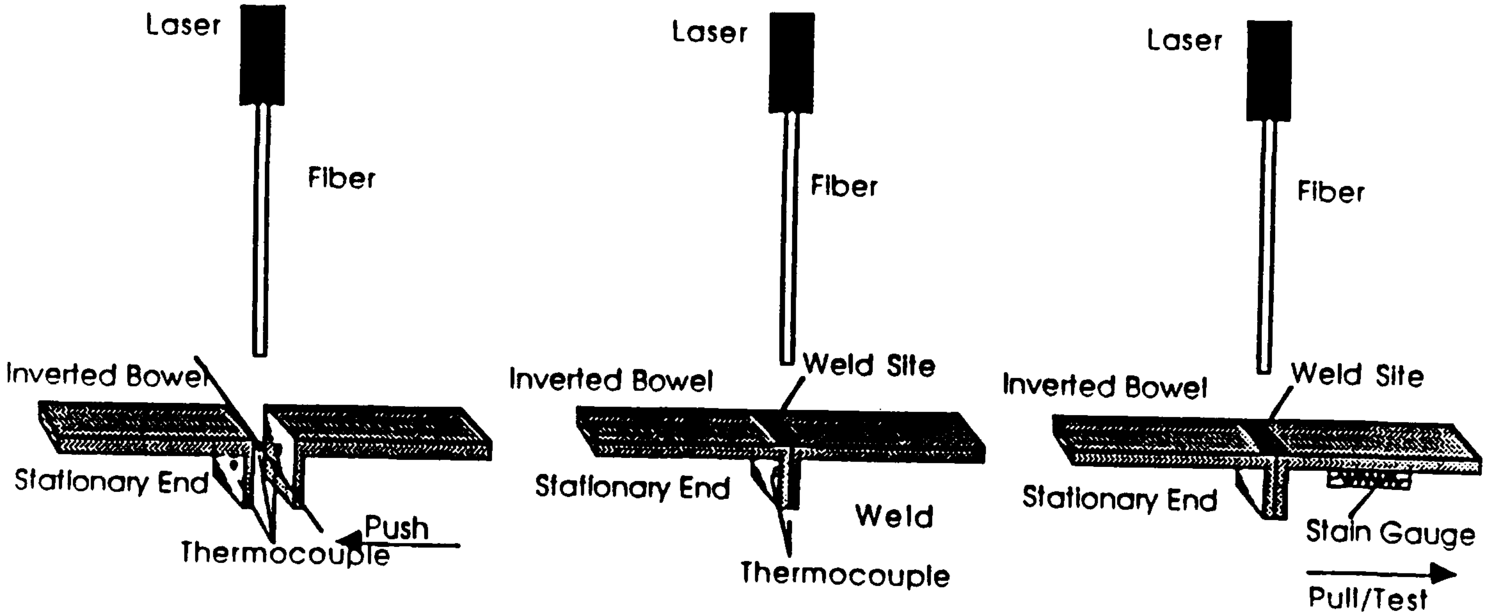

Figure 2- Experimental Protocols

LASER TISSUE WELDING OPTIMIZATION PROTOCOL

Time (s)	Aperture Size (mm)	Power (W)	Chromophore
2	0.5 x 4.0	0.05	None
10	0.5 x 4.0	0.05	None
2	2.0 x 4.0	0.05	None
10	2.0 x 4.0	0.05	None
2	0.5 x 4.0	2.0	None
10	0.5 x 4.0	2.0	None
2	2.0 x 4.0	2.0	None
10	2.0 x 4.0	2.0	None
2	0.5 x 4.0	5.0	None
10	0.5 x 4.0	5.0	None
2	2.0 x 4.0	5.0	None
10	2.0 x 4.0	5.0	None
2	0.5 x 4.0	0.05	India Ink
10	0.5 x 4.0	0.05	India Ink
2	2.0 x 4.0	0.05	India Ink
10	2.0 x 4.0	0.05	India Ink
2	0.5 x 4.0	2.0	India Ink
10	0.5 x 4.0	2.0	India Ink
2	2.0 x 4.0	2.0	India Ink
10	2.0 x 4.0	2.0	India Ink
2	0.5 x 4.0	5.0	India Ink
10	0.5 x 4.0	5.0	India Ink
2	2.0 x 4.0	5.0	India Ink
10	2.0 x 4.0	5.0	India Ink
2	0.5 x 4.0	0.05	ICG
10	0.5 x 4.0	0.05	ICG
2	2.0 x 4.0	0.05	ICG
10	2.0 x 4.0	0.05	ICG
2	0.5 x 4.0	2.0	ICG
10	0.5 x 4.0	2.0	ICG
2	2.0 x 4.0	2.0	ICG
10	2.0 x 4.0	2.0	ICG
2	0.5 x 4.0	5.0	ICG
10	0.5 x 4.0	5.0	ICG
2	2.0 x 4.0	5.0	ICG
10	2.0 x 4.0	5.0	ICG
2	0.5 x 4.0	0.05	Blood
10	0.5 x 4.0	0.05	Blood
2	2.0 x 4.0	0.05	Blood
10	2.0 x 4.0	0.05	Blood
2	0.5 x 4.0	2.0	Blood
10	0.5 x 4.0	2.0	Blood
2	2.0 x 4.0	2.0	Blood
10	2.0 x 4.0	2.0	Blood
2	0.5 x 4.0	5.0	Blood
10	0.5 x 4.0	5.0	Blood
2	2.0 x 4.0	5.0	Blood
10	2.0 x 4.0	5.0	Blood

Rabbit Animal Prep Protocol

Supplies Needed:

Alcohol Preps

1 ml Tuberculin Syringe

3 ml Syringe

#18 Needle

#22 Needle

Gemini Xylazine (Rompun)

Ketaset (Ketamine)

100 ml. bag of 0.9% NaCl or 5% Dextrose in Water for intravenous use

Microdrip (60 drops per ml) dispenser and tubing

Animal Clippers

Manual (non-electric) Razor

Artificial Tears Ointment

#22 JELCO IV Catheter Placement Unit

Paper Tape

Beuthanasia (sodium pentobarbital or formerly known as Sleepaway)

Procedure:

1. One day prior to desired surgery, remove food container from rabbit's cage. Leave water bottle.

2. Prepare tray of surgical instruments for autoclaving. Place blue cloth drape under and over instruments. Add hemoclips, needle holders, atraumatic clamps, and other specialized instruments as needed. Autocjave instruments.

3. Collect all supplies listed above. Place in rabbit room.

4. Close door to rabbit room.

5. Determine amount of Rompun injection. A chart which indicates the appropriate amount to inject is appended to this document.

6. Prepare Rompun injection. Wipe the septum of the Rompun bottle with an alcohol prep. Remove tuberculin syringe from packaging. Insert syringe into bottle and carefully dispense correct amount.

7. With syringe in hand, gently and quietly open door to selected rabbit's cage. Pet rabbit gently to reassure. After calming rabbit, obtain control over the animal by grasping firmly at the neck. Hold down rabbit and inject Rompun into the muscle in the hind quarter.

8. Close rabbit cage. Wait approximately 10 minutes for rabbit to become sedated. Rabbit may slouch or turn head to side.

9. Remove rabbit from cage, supporting head and neck carefully.

10. Transfer rabbit to sink.

11. Using chart in appended to this document and the actual weight of the rabbit, determine the appropriate amount of Ketaset to inject.

12. Prepare injection of Ketaset. Remove the 3 ml. syringe from its packaging and place the #18 needle on the end of the syringe. Wipe the septum of the Ketaset bottle with an alcohol prep, and insert syringe. Remove desired amount of Ketaset and then carefully change needles from the #18 to the #22. Grasp the rabbit firmly and inject Ketaset, using the #22 needle, into the hind quarter.

13. Wait approximately 10 minutes for the rabbit to become completely anesthetized. The rabbit is completely anesthetized when it can be picked up and placed on its back and does not attempt to turn itself over.

14. While waiting, prepare intravenous anesthetic cocktail. To the 100 ml. 0.9% NaCl bag add 4.0 ml. Rompun and 8.0 ml. Ketaset. Invert bag to mix. Hang bag on IV pole. Insert microdrip and tubing into bag and then remove plastic cover from distal end of tubing. Place three or four strips of paper tape on the IV pole for later use.

15. Place three or four paper towels on the countertop next to the sink and two paper towels inside the sink. Place rabbit, belly up, on the countertop.

16. Apply Artificial Tears to the rabbit's eyes to prevent painful drying.

17. Using a marker, number the rabbit by writing its identification number from the experimental protocol inside its ear

18. Use electric clippers to shave appropriate area of rabbit, usually abdomen and groin. Push excess fur onto the paper towels. Quickly remove paper towels and fur as soon as clipping is completed.

19. With non-electric razor, gently remove hair from the ears, particularly along the external vein. This vein will be used for the intravenous anesthetic.

20. Transfer the rabbit to the surgical site.

21. Wipe the external ear vein region with an alcohol prep. This should improve visualization of the vein.

22. Remove JELCO catheter from its packaging. Insert catheter into the external vein. Use needle to enter vein and then pull back on the needle so that the catheter slides along the inside of the vein. Watch catheter slide inside the vein. Look for a backflow of blood into the top part of the catheter placement unit. Remove the needle completely when the catheter has been correctly positioned.

23. Attach the tubing from the IV bag to the top part of the catheter placement unit. Test catheter placement by slowly opening the anesthetic flow regulator and watching for anesthesia flow. Alternatively, open the saline regulator if one has been piggy-backed, and watch its flow. When adequate placement is verified, carefully tape the tubing and the catheter placement unit to the rabbit's ear. Tape excess tubing to the table.

24. Adjust the anesthetic flow rate to 1 drop every 4 seconds. Watch the rabbit's chest rise and pupil size to monitor anesthesia. If rabbit begins to come out of the anesthesia, increase rate to 1 drop every 2 seconds for about 1 minute. Return to 1 drop every 4 seconds, and wait until rabbit is sedated (1-2 minutes).

25. If rabbit is to be euthanized, inject 4.0 ml. of 1:1 diluted Beuthanasia into the septum of the IV line. The bottle will indicate if it has already been diluted. If it has not been diluted, mix equal parts of concentrated Beuthanasia and 0.9% NaCl, and inject this solution into the IV line. Do not inject concentrated Beuthanasia into the IV line because it is very viscous, and therefore, it is difficult to force it out of the tubing and into the rabbit.

26. After rabbit has died, remove IV line and place rabbit remains into a large brown plastic bag.

27. Carefully wash instruments. Alconox or similar detergent should be used. Never leave instruments soaking in water. Rinse instruments and place them on a towel to dry.

RABBIT ANESTHESIA

INITIAL INTRAMUSCULAR DOSE OF XYLAZINE GIVEN, FOLLOWED 10 MINUTES LATER BY AN INTRAMUSCULAR DOSE OF KETAMINE. DOSAGE BASED ON WEIGHT OF RABBIT.

WEIGHT(LBS.)	XYLAZINE 20 MG/ML ML	KETAMINE 100 MG/ML ML
4	0.5	0.72
4.25	0.53	0.77
4.5	0.56	0.81
4.75	0.59	0.86
5	0.63	0.9
5.25	0.66	0.95
5.5	0.69	0.99
5.75	0.72	1.04
6	0.75	1.08
6.25	0.78	1.13
6.5	0.81	1.17
6.75	0.84	1.22
7	0.88	1.26

INTRAOPERATIVE ANESTHESIA CONSISTS OF 4 MG KETAMINE + 2 MG XYLAZINE IN 50 ML DILUENT, INFUSED AT 1 DROP EVERY 4-6 SECONDS FOR A 6-8 LB. RABBIT.

Tissue Preparation for Weld Strength Optimization Study

1. Make a midline incision with a #15 scalpel.

2. Identify and isolate the small bowel.

3. Place an atraumatic clamp across the mesentery at the section to be resected.

4. Place a hemoclip at the site of the nearest vessles to occlude blood flow.

5. Resect a small segment of bowel measuring approximately 5 cm.

6. Return the remaining in situ bowel to the abdomen.

7. Make a longitudinal cut in the bowel segment, and open it up. Carefully rinse the bowel segment in physiological saline to remove succus entericus.

8. Using the specialized cutters, cut two strips measuring 4.0 x 20.0 mm. Place the two strips into the clamps, making sure that the strips are aligned relative to the marks on the clamps.

9. Apply a barely visible amount of chromophore with a cotton-tipped applicator. The chromophore should be applied to both tissue strips.

10. Position the thermocouple between the two tissue strips.

11. Slowly bring the two tissue strips into apposition using the computer-controlled piezoelectric motor.

12. Verify appropriate thermocouple placement (1 mm below surface of weld).

13. Set laser welding parameters in laser welding control program. Weld tissue.

14. Switch to the tensiometry data acquisition program. Pull tissue apart and measure the load required to rupture the weld.

15. Repeat steps 5-14 to prepare additional tissue strips.

16. Import data into Lotus or Symphony to generate load versus distance plots.